THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XIX. No. 471—22ND YEAR.] LONDON, OCTOBER 25, 1870. [Subscription per Annum. { 15s. in Advance. 18s. Credit.] DOUBLE No. Price 1s.

RAMSAY'S NEWCASTLE CANNEL
COAL. Analysis—
10,000 cubic feet of gas per ton of coal.
26-candle gas.
13¼ cwt. coke per ton of coal.
RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828.
FIRE-BRICK WORKS, established 1804.
FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay.
The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article.
The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
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GEORGE GLOVER & CO.,
Patentees of the Standard Gasometers for the Government, and of the
IMPROVED DRY GAS-METERS.

These Meters are warranted to measure correctly and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured.

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15, MARKET STREET, MANCHESTER.

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JOSEPH COWEN and CO.,
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Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they have also been awarded in the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts in the United Kingdom; and orders for Fire-Clay Retorts of all shapes and dimensions, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Coal Office,
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FIRST PRIZE IN THE PARIS EXHIBITION.

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ALMA WORKS,
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AND
STREET-LAMP
MANUFACTURERS,
BELL BARN ROAD, BIRMINGHAM.
ESTABLISHED 1830.
All materials found for the alteration of Public Lamps for lighting with the Rod. Regulators with Lava Burners.

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PRIZE MEDALS.
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A. ANGUS CROLL, C.E., Chairman. GEORGE RAIT, Managing Director.

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Twyere Coils for Blast Furnaces, Boring Tubes, Core Bars, Gun-Metal and other Cocks, Boiler Mountings &c.
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Also ORDINARY WELDED WROUGHT-IRON TUBES and FITTINGS,

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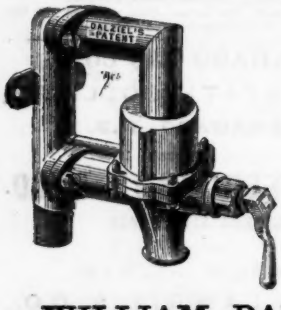

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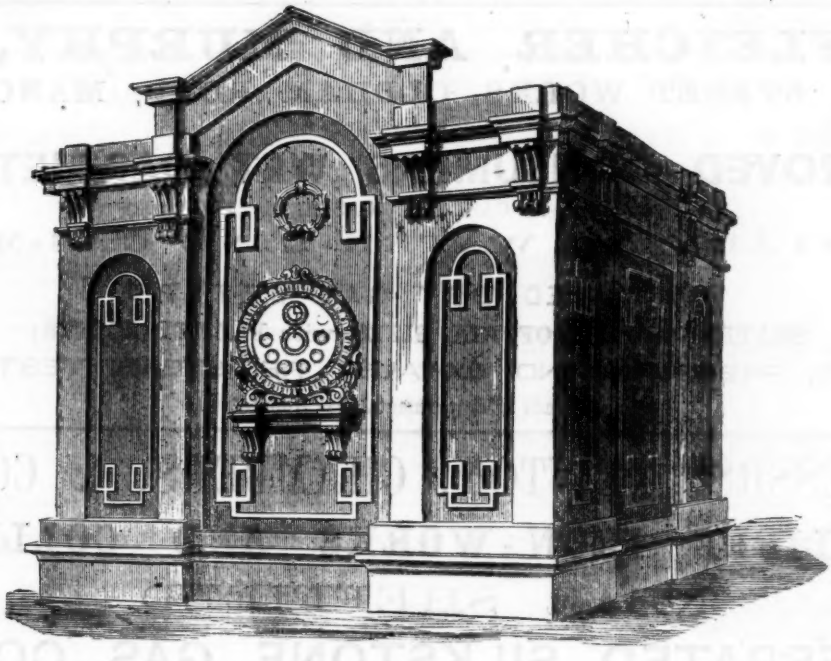
DESIGN FOR STATION-METERS.

From 45,000 to 120,000 Cubic Feet per Hour.



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Meters of a similar design may be seen n operation in London, Manchester, Liverpool, Dublin, Oldham, Leeds, Bristol, Halifax, Salford, Stockport, Wolverhampton, Rochdale, Bradford, Bolton, Blackburn, and many other places.

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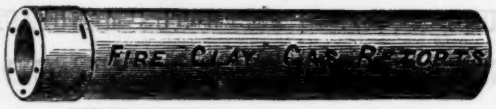

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CELEBRATED SILKSTONE GAS COALS.

Analyses by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

Description.	Cubic Feet of Gas per Ton of Coals.	Illuminating Power in Candles.	Coke per Ton of Coal used. Cwt.	Ash in Coke per Cent.	Sulphur in Coal per Cent.
Best Silkstone . .	10,900	17·0	12·8	2·6	1·7
Norfolk Silkstone . .	11,000	15·94	12·5	4·4	1·64
Silkstone Brights . .	11,500	14·5	12·6	7·4	1·85
Silkstone Nuts . .	10,800	15·85	12·66	6·0	0·69

NOTE.—The illuminating power of the Gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

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PATENT PLATINUM
GASLIGHT PERFECTER.

Extract from Report by Dr. Letheby:—

"The results have been very remarkable, for they show an average increase of 63 per cent. on the illuminating power of the gas. I am of opinion, therefore, that the invention is of great practical value."

Extract from Dr. Frankland's Course of Lectures at the Royal School of Mines, February, 1868.

"Scholl's Platinum Perfecter is one of the most important inventions of modern times in connexion with the burning of coal gas."

Price 1s. each for Fishtail Burners.

To be had retail of Gas-Fitters and Ironmongers.

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Terms on application. N.B.—A specimen sent free on receipt of Twelve stamps.

*** Further testimonials from Drs. Frankland and Crooks, showing the great practical value of this invention, will be shortly published.

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Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,
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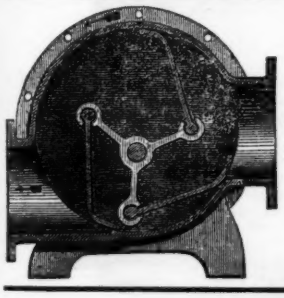
Station-Meters, Governors, Consumers Meters, Gas Lustres, Chandeliers, Brackets, &c., and every description of Gas-Fittings and Gas Apparatus.



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(From 250 Feet upwards per Hour.)
Also,
ROTARY TAR AND OIL PUMPS.
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NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of Clay Retorts, Fire-Bricks, and every description of Fire-Clay Goods.

BRONNER'S PATENT GAS-BURNERS
give 99 per cent. of light, as compared with 27 per cent. given by ordinary burners, with equal consumption of gas.—*Vide* "Gas Referees Report," published June, 1869.
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Established 1811.

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And every Description of
GAS-FITTINGS,
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MEDIÆVAL FITTINGS FOR CHURCHES, &c
Large Pattern-Books complete, with Book of Prices, 7s. 6d.

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RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY
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The Works are of such magnitude as to ensure the prompt execution of orders to any extent.
Estimates for Setting, or Bricklayers sent when required.
GAS OVENS IN SEGMENTS OF EQUAL QUALITY.
A large Stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all Sizes kept in London at Mr. ALFRED WILLIAMS, Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.
N.B.—*Export orders continue to have prompt attention.*

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ALPHA TUBE & FITTING WORKS

ECONOMY IN GAS PURIFICATION. A PURER GAS AT LESS COST, AND GREAT SAVING IN LABOUR.
M'DOUGALLS' PRECIPITATED PEROXIDE OF IRON.

The above Oxide is now in use at some of the largest works in the kingdom, and has gained a decided preference, owing to its efficiency, cheapness, and the great saving in labour effected by its use.
It is a pure artificial Hydrated Peroxide, with an addition of only sufficient sawdust to give it the needful lightness or porosity to prevent pressure, and every particle is available for use.
In selecting an oxide, a point more important than its price, is to learn the cost of labour entailed in its use. Whilst at large works the cost of labour for purifying, where lime alone or the natural oxides are employed, is 2d. to 3d. per ton of coals, by the use of the above Oxide it is reduced to 1d. to 1½d., owing to the purifier's working so much longer when charged, and to rapid revivification—two points of special importance in the busy season.
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NOTE.—It is important to note that only the Hydrated Peroxide of Iron is useful, simple oxide being worthless. Inferior oxides show a large per centage of simple oxide, but very little Hydrated Peroxide.

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SWANWICK CANNEL.
The yield of this Cannel is liberal, the illuminating power large, and coke good.
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Same quality as supplied by us to several of the most extensive Gas Companies, and which has given entire satisfaction.
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Successors to
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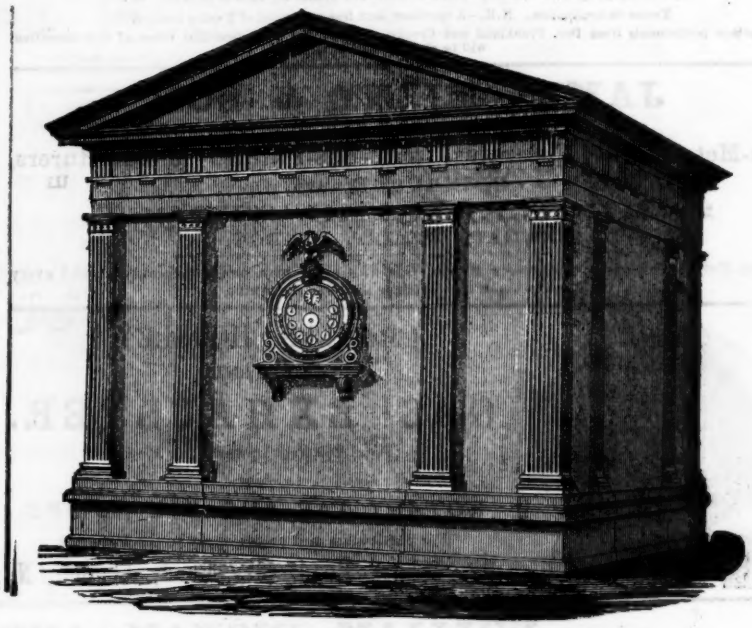
GLOBE METER-WORKS, OLDHAM,
MANUFACTURERS OF
IMPROVED CONSUMERS GAS-METERS,
Of the best material and workmanship, carefully adjusted to the requirements of the British Sales of Gas Act and Foreign Standards of Measures.
PATENT FIXED WATER-LINE GAS-METERS,
Which are uniform with the ordinary Meters, and register with minute accuracy.
IMPROVED DRY GAS-METERS,
IN BEST TINNED IRON CASES.



GAS STATION-METERS,
WITH PLANED JOINTS.
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Home and Foreign Orders promptly attended to.
All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.
Orders almost invariably despatched on the day of receipt.
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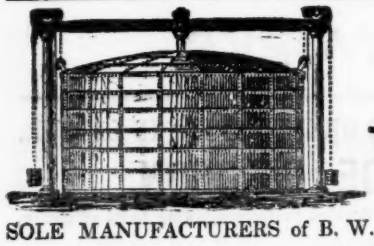
GAS STATION-METERS,
With all the Joints planed,
GOVERNORS, GAUGES, INDICATORS, EXHAUST GOVERNORS, &c.
TERMS, &c., ON APPLICATION.



IMPROVED GAS APPARATUS,
FOR CITIES, TOWNS, VILLAGES, &c.,
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MORTON'S PATENT SELF-SEALING RETORT-LIDS.

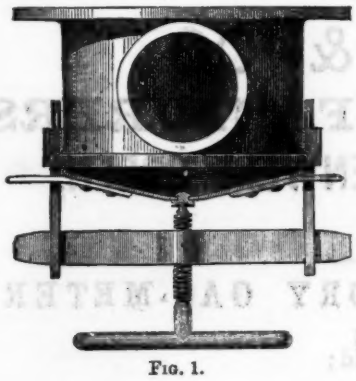

Fig. 1.

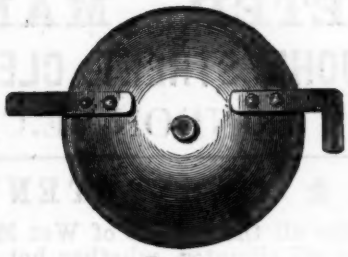

Fig. 2.

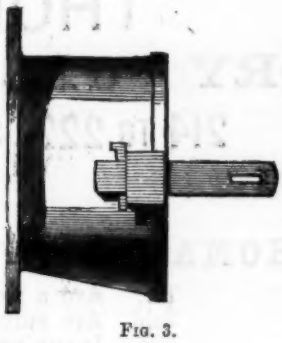

Fig. 3.

Several Hundreds in successful operation in various Gas-Works.

The expensive and cumbersome process of sealing the mouths of Gas-Retorts by means of luting the Lids with lime and other materials hitherto used for that purpose, is henceforth rendered unnecessary, and will be superseded by the very efficient method shown in the accompanying illustrations.

Fig. 1 shows a plan of a mouthpiece with Morton's Patent Lid in section. The mouthpiece is faced true, and the projecting circular edge or periphery of the lid is also turned true, and, by preference, of a semicircular section, so that the point of contact is reduced to a minimum; the convex form of the Lid rigidly sustains the force of the screw, which, by its central action, gives the Lid a uniform bearing, and effectually seals the mouth of the Retort.

Fig. 2 shows a front view of Morton's Patent Lid, which is stamped out of plate iron, having (in this case) ledges to rest on the lugs of the mouthpiece; these Lids, however, are more generally fitted to hinged cross-bars, by which means they remain suspended while the charge is withdrawn and the Retort charged, so that the damage done by throwing them about is entirely prevented.

The advantages obtained are—

1st. The sound sealing of the Retort during the whole time it is carbonizing the charge of coal, there being no jointing medium between the Lid and the mouthpiece.
2nd. The improved condition of the coke by the non-mixture of lime.
3rd. The Lid requires no preparation on the part of the stoker, beyond slightly scraping the surface to remove extraneous grit or dirt.
4th. The Lids are only about two-thirds the weight of the old form in general use, a Lid for a 16-inch mouthpiece weighing a little over 20 lbs.
5th. The Self-sealing Lid reduces labour, saves wear and tear, obviates all the inconvenience and discomfort consequent on the preparation of luting, and effects a great reduction in the working expenses. The cost attending the process of "luting" in several large gas-works, exceeds £1000 per annum, ranging in various works from 20s. to 35s. per mouthpiece.

It will be obvious that a round Lid is the most convenient and the cheapest form. D Retorts are adapted for round Lids, by carrying the bottoms down the necessary depth for that purpose, as shown in Fig 3. Some mouthpieces have been thus adapted, and are in use at the Chartered Gas-Works.

The following testimony speaks in favourable terms after ample and careful test:—

Burslem and Tunstall Gas Company, Longport, Staffordshire, Oct. 12, 1869.

Dear Sir,—In reply to your favour of the 9th inst., I have pleasure in stating that my admiration for your Patent Retort-Lid is most unqualified. I have 14 of them in use, and have tested them in the severest manner possible at these works, but without being able to detect the slightest defect. Yesterday the strap slipped off the exhauster, and a pressure of 13 inches was thus almost instantly thrown upon the Retorts, but although many of the luted Lids were leaking, not the slightest escape was observable from yours. I had anticipated that at least some greater degree of care would have been required in the scraping of the mouthpieces after the drawing of each charge, but even in this particular I find that labour has been reduced.

By every stoker on these works, as well as by myself, your Lids are regarded as a boon.

Please send me 30 more at your earliest convenience.

I am, &c., (Signed) HENRY WOODALL.

R. Morton, Esq.

Chartered Gas Company, Horseferry Road, Westminster, Sept. 15, 1869.

Dear Sir,—I have only lately returned to town, which is the reason I have not replied earlier to your inquiry.

I beg to say that I have had your Lids in use for upwards of two months, and during that time they have always kept a perfectly sound joint. I may add that where your lids are used only one set is required.

I remain, &c., (Signed) G. O. TREWBY.

R. Morton, Esq.

Chartered Gas Company, 146, *Goswell Street, E.C., Oct.* 20, 1869.

Dear Sir,—I have much pleasure in stating that, after some months trial of your Retort-Lids, I find them everything I could desire. I consider the plan a great improvement.

I am, dear sir, yours truly, (Signed) A. UPWARD.

R. Morton, Esq., London Gas Company.

These Lids are in successful use at the London Gas-Works, the Chartered Gas-Works, the Dublin Gas-Works, the Burslem and other Works, giving great satisfaction.

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Sole Makers of Upward's Patent Safety Drilling Apparatus, Weston's Patent Differential Pulley Blocks the "Special Steam-Pump," the Patent Duplex Lever Punch, &c.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

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2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

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PATENT WET & DRY METERS,

STATION-METERS AND GOVERNORS,

PRESSURE REGISTERS, GAUGES,

EXPERIMENTAL METERS, PHOTOMETERS, GASHOLDERS, &c., &c.

WATER METERS.

W. P. & Co. beg to state that they are now prepared to supply Station-Meters with planed joints.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

NOTICES.

The subscription to the JOURNAL is 15s. per annum, if paid in advance during the month of January, or 18s. credit, in two sums of 9s. each, in July and January of each year. Post-Office orders should be made payable at the Money-Order Office, London, to William B. King, 11, Bolt Court, Fleet Street, by whom the business department of the JOURNAL is conducted.

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The next number will be published on Tuesday, November 8, and the subsequent numbers on each successive alternate Tuesday.

All communications for the Editor to be addressed, "No. 42, Parliament Street, Westminster;" and all remittances for subscriptions or orders for advertisements to the Publisher, No. 11, Bolt Court, Fleet Street.

THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 25, 1870.

Notes upon Passing Events.

A BILL for regulating the system under which licences are granted to public-houses for drinking, for music, and for dancing, must be amongst the non-political reforms of our ministers if they much longer retain their seats. At present they seem very firm in the saddle. In the metropolis the whole system is simply one of robbery and jobbery, occasionally redeemed by a burst of honest indignation at something really too bad. At the last licensing day at Clerkenwell, the magistrates, under the influence it is to be presumed of a new chairman and a new Commissioner of Police, destroyed about fifty thousand pounds worth of property at one blow, and very properly. The wonder was not that they did the deed, but that they had allowed the nuisance to grow up to such monstrous proportions. The alleged reason for withdrawing the licences from the Alhambra and Highbury Barn was the manner in which a particular ballet was danced—the "Can-"can." Now the "Can-can" is a dance that can only be danced by prostitutes. It is the French edition of the Indian *Nautching*. In Paris it meant, at the masked and other balls of the *Putins* of that city, as many lascivious gestures as the *gendarmes* stationed to preserve order would permit. It was an outrage on decency that such a performance should be advertised at all. To forbid dances where women of easy virtue, or no virtue at all, can resort, would be absurd. Prostitution cannot be stamped out—it has existed since the earliest historic times, and always in the same per centage in large cities—but decency may be preserved. No woman is corrupted by such a place as the Argyle Rooms, because the character of the place is admitted. The injury is done by places like Highbury Barn, where decent girls of the lower classes are brought into contact with professional strumpets. The stage performances were only one addition to the general corrupting influences of the establishment. That such a den of corruption should have so long existed is due to the immense influence of brewers and distillers, for whose interests so many magistrates live, breathe, and have their official existence. The Alhambra professed to be a sort of theatre for music and dancing, but the admissions at the doors would hardly have paid the working expenses, much less a heavy dividend. It was as a drinking-booth that it was profitable—cheap liquors retailed at high prices in "the canteen" to men who paid without counting, for the pleasure of sitting cheek by jowl, to say the least, with the scantily attired nymphs of the ballet. So the Alhambra flourished as a gorgeous edition of what used to be vulgarly called in Lancashire a cock-and-hen club. A reaction, headed by the Police Commissioner, has caused a dancing licence to be forfeited which ought to have been withdrawn long since, and would have been had any distinct principle regulated the distribution of drinking, music, and dancing licences. In the early railway days, committees of the House of Commons were almost unlimited in numbers, and members often never troubled themselves to attend to hear the evidence. They flocked in on every important division. Step by step the numbers of select committees on private bills have been reduced until the responsibility of decision practically rests with the chairman. If the licensing business of the metropolis were divided into districts, instead of being left to a mob, each district to be licensed by a bench of two or three stipendiary magistrates, with an appeal to a full bench, presided over by a quarter sessions judge, there would be perhaps fewer fortunes made in building public-houses, but the distribution of licences would cease to be a matter of chance and of favour. Some magistrates have crotchets about dancing, some about music, an indistinct minority about drinking, when in reality the business should be carried on on good police principles, which would secure order, decency, and sobriety.

The Institution of Civil Engineers have issued a very good list of subjects for premiums for the next session. As engineers have, at present, nothing to do but to talk, write, and propose sensational schemes for the expenditure of millions, there are likely to be some very good papers, either by gentlemen ready to retire on their reputation, or by those who hope to be the engineers of the future. Amongst the subjects affording room for original observations, we note "The Different Systems and "Results of Road Traction-Engines." These are now extensively used for moving agricultural machinery, and, to the great surprise of many mechanics, a report in favour of using Thompson's road traction-engines for military purposes has been made by Mr. Anderson, known best in connexion with the small-arms factory. "The Principles to be Observed in Laying out Lines of Railway in "Mountainous Countries" will bring out authentic reports on the work done in the Alps, the Pyrenees, the Indian ghauts, and the Rocky Mountains of America, and on the coast of Brazil. Traction and locomotive plans will be compared. "The Gauge of "Railways" will not renew the dead conflict of the broad and narrow gauge, but raise the question of where and when a gauge of half the dimensions of the narrow may be usefully employed. "The Principles to be Observed in the Extensions of Large Towns "and Cities" ought to find something for the large and recently created engineers of various Boards of Works to say. There is

room for a nice polemic on "The Advantages and Disadvantages "of Subways for Gas and Water Mains." The promoters of gigantic schemes for giving the metropolis new and original sources of water supply will have an opportunity of airing their ideas, and we shall, perhaps, hear, under the strict seal of confidence, the truth about the effect of the great drought on the model Manchester system, as well as what our stubborn conservative engineers have to say against the constant supply, which sooner or later they will have to afford. "The Disposal of Sewage" will be discussed for the hundredth time. Surely on so fertile a subject there were never more barren debates. Mr. Hope, V.C., if he does not write, will certainly tell something amusing about the Romford and the Lodge farms. "The Application of Steam Power "to Agriculture" has never yet been treated in a full historical and practical manner. It might begin with Josiah Parkes's trials on Chat Moss, and the first attempt at threshing by steam, and finish with one of those model farms where hand labour and horse labour have been brought to a minimum. The paper "On the "Construction of Gas-Works" ought to afford a very useful debate. We may expect a record of the latest improvements where improvements are occurring daily, in the papers on "Ships "of War," on "Steel," and on "The Progress in Telegraphic "Engineering." These are a few amongst thirty-eight remarkably well selected subjects.

For the last forty years almost all American writers of travels in England, and many continental foreigners, have prophesied the early extinction of the English aristocracy. Mr. Dallas, about the time of the American War, invited his friends to come soon and see a brilliancy that could not last long, and M. Ledru Rollin's "*Décadence de l'Angleterre*" is not quite forgotten, although he is himself. Whatever may be the prospects of aristocratic institutions, they appear quite as safe as seventeen years ago, and much more assured than when the first Reform Bill passed. The reason is that it is so difficult to fix where the commoner ends and the aristocrat begins. The only privilege retained by peers is that of legislation, and that, by the abolition of the proxy system, is left to a very small number. The exemption from arrest has ceased to be a privilege with the abolition of imprisonment for debt. At the present moment five peers are willing or unwilling candidates for the clearing process of the new Bankruptcy Act. The reason that the British aristocracy have hitherto preserved themselves from the dislike and contempt which is the fate of so many foreign nobles is, that the junior branches, having no titles, become early absorbed in the ranks of the people. Their noble connexion often gives them a start in life, but if they fail, they are lost to sight with the unennobled Browns, Joneses, and Robinsons.

It has been the lot of England to show an example of royalty descending into the ranks, and making an alliance out of the pale of that blue blood so sacred to the eyes of German nobility. The French Revolution and the wars that followed, the peace of of 1815, the Prussian-Austrian War of 1866, have destroyed —mediatized is the diplomatic term—nests of the princes amongst whom royal princesses found husbands of suitable pedigree. Newspapers, that record everything, tell us to what shifts Protestant princes and princesses are likely to be reduced if royal blood is to be essential in the future marriages of our reigning family. Her Majesty has wisely broken through precedents and prejudices, and accepted a nobleman for her daughter's husband, without the claims, whatever they may be, of the spouses in the two preceding marriages. The news will be received with horror by those German families who consider at least sixteen quarterings necessary to make a gentleman, but in England it will be looked on as a wholesome escape from enforced celibacy or embarrassing alliances. The good looks, good health, and wealth of our aristocracy are due to the power they have exercised of marrying low and where they pleased. According to all appearances, in the next generation there will be a number of princes and princesses who will be most agreebly and easily provided for by sinking royalty and amalgamating with the nation. But just as our liberty of marriage, which so astonishes Germans and Frenchmen, occasionally leads to degrading alliances amongst lords and commons, so, without some restraint, royal princes might make marriages satisfactory to no one.

An agitation is rising for freeing the metropolitan bridges from tolls. About the desirability of this measure, especially to all the classes to whom rent is an object, there cannot be the slightest question. What traffic may be thus created is shown by Southwark Bridge—perhaps the least convenient of the metropolitan thoroughfares. It is, however, not likely that the nation will pay for the benefit of London. There is only one feasible way of freeing Waterloo Bridge. The tolls have not risen to an appreciable extent for years. The people who repair the bridge, the solicitors, and the toll-keepers are the only persons who benefit by the small profits after paying expenses. Let the Surrey side consent to a loan to be raised on their rates, or a special rate, and repaid in thirty years. Let an Act of Parliament be passed compelling the shareholders to go to a jury to ascertain the value of this property. Let that value be paid in annuity bonds for thirty, or any other number of years, guaranteed by the Metropolitan Board. The shareholders would get a negotiable security for their dead-alive property, the mortgagees would be paid off, the public would have a free bridge, and the holders of property on the Surrey side would find it greatly improved in value. Vauxhall Bridge has been very much diminished in value, as a way out of London, by the improvement of Westminster Bridge, combined with the two Thames Embankments. Compulsory sale is the key-note of bridge-toll repeal. Tens of thousands of houses, beside churches and churchyards, have had to make way for railroads, under compulsory powers of sale. There is no reason why bridge shareholders should not yield to the same fate for the benefit of the metropolis. The Battersea and Putney nuisances are placed within the vice of the Metropolitan Board, and will have to improve or disappear; but Waterloo Bridge is a very big concern—too big for the Metropolitan Board to manage without external assistance. The penny omnibuses have effectually arrested any probable increase of the Waterloo tolls.

Cheapside is open with the Val de Travers pavement—very clean, very silent, very smooth. No tramway is required there. We wait with anxiety for the winter test. At present we hear of no dreadful accidents, although "the smoothness is shocking "to see," and one may expect every moment to find horses slipping down sideways. The shopkeepers are delighted with the change. Their influence will probably extend it rapidly.

Marylebone has at length imitated the example of Islington, and taken up the steam-roller to reduce macadam to a level surface, without an unlimited waste in the wheels, springs, and horses feet of private vehicles. A very sensible report by the Marylebone district surveyor shows that hiring Aveling and Porter's steam-engine costs a little more than a horse roller, but he justly observes the good work is worth the money. In public improvements it is often a mistake to be guided by the money test only. It would be difficult to show what every individual in a street gains by the sum paid for street lighting. You might find persons who would be without street gas if they could, as they do no business, and never go out after dark. The same may be said of sewers, house-drains, and foot-pavements. They are the luxuries in comfort and in health of civilized life. The steam-roller was at work the other day just opposite the Langham Hotel, in Portland Place. At night the people would go to bed with a roadway fit to bring a charge of cavalry to a walk; they might rise the next morning (at London hours) and find it as smooth as a garden walk. Who can calculate the value of such a style of road-making? When the roller belongs to the parishes, instead of being hired, it will lead to more careful preparation of the road for its operations—more care in making the bed and gauging the size of the stones. Stone-breaking is the pauper's test, but it is much more successfully performed by a machine.

The reaction against pampering vagrants and paupers on the tramp that was to be expected has taken place. The pleadings of the humanitarians are drowned by the cries of indignant ratepayers. It was discovered a few years ago that vagrants travelling round the country, on business or pleasure, were very harshly treated in casual wards; that workhouse masters, acting under the orders of magistrates and local authorities, made these alien and unprofitable visitors uncomfortable, even to the verge of cruelty. It was also discovered that amongst vagrant casuals there were some respectable people and distressing cases. Humanity took alarm, and a series of regulations were issued from the Central Board, the effect of which was to universally improve the position of the vagrant without imposing any penalty in return for the supplies. Looking at the state of public opinion at the time, it is difficult to see how the Poor Law Board could have acted otherwise. But, fortunately, if the people of this country are sometimes led in the wrong direction by a sensational relation of isolated facts, the free daily publication of news and discussion brings it right. To a gentleman clad in whole clothes, even if rather worn, accustomed to sleep in a bed with mattress, blankets, pillows, and sheets every night—to find a washing-basin, soap, and clean towel every morning—to have at least breakfast, dinner, and tea at regular hours every day—it does seem extremely dreadful to be housed for the night as casual vagrants, and even in the most luxurious workhouses. But it must be remembered that just as there are persons who by preference embrace callings involving hardships and disgusting duties, such as penny-a-liners, marines, sailors, scavengers, chimney-sweeps, acrobats, and itinerant musicians, so there are thou-

sands who accept rags, vermin, uncertainty as to food and rest, in the most inclement weather, because they prefer occasional debauches on the produce of begging, cheating, and robbery, with all the drawbacks, to regular work, regular hours, and the control of a master. However miserable 90 per cent. of the vagrants may seem when they tell their stories to sympathizing ears, or however miserable they may really be on rainy, frosty nights or days, after an interval of bad luck—that is, want of success in begging and cheating—they would not exchange "their "hollow tree and liberty" for steady employment at any wages. The other 10 per cent. may be unlucky and reclaimable. The key-note for repressing the growing army of pauper vagrants has been struck by the Earl of Carnarvon, as chairman of quarter sessions. A system of repression must be adopted—a uniform system under which the life of the vagabond must be made as uncomfortable as possible, with due regard to health. Legislative sanction and assistance should be given to the system of relieving all beggars by tickets instead of money. If the police were employed to deliver these tickets to every begging character, and punishment followed the pauper who begged after receiving a ticket, a step in advance would be made. All pauper children should be swept from the street into industrial schools. Children are the best machinery of a vagrant beggar. We must harden our hearts and open our purses for industrial schools if we want to put down the cause of vagabondism, now supported by alms and housed in casual wards.

A field officer of the Guards has proposed, in a letter to the *Times*, that the boys in the schools of Eton, Harrow, Winchester, Westminster, and Rugby should be compelled to learn military drill, and that military instruction suitable for the preparation of subaltern officers should be provided for those that way inclined. Not without reason there has been a cry against the excessive devotion to athletic sports in our public schools. Military training would absorb a very small portion of the time now devoted to cricket, football, rowing, &c. If the great public schools set the example, the less fashionable would quickly follow suit. Drill might be one of the special conditions for Government-assisted or rate-supported schools. In parish schools a stroke of Mr. Göschen's pen would make universal a practice very generally adopted in the metropolitan parishes. The prize system, so often foolishly applied, might be brought into play to reward individual and school merit. At present a very insignificant number join the volunteer corps of public schools. A compulsory regulation would turn files into battalions. The uniforms should be simple, but distinctive and alike, except in colour. The arms might well be found at the expense of a school fund; for it is absurd to arm boys of 13 with a man's rifle.

The pawnbrokers do not find much support to their views in the evidence of those not connected with their trade. They succeed in showing that pawnbroking pure and simple is not very profitable; but an auctioneer, whose business lies with them, explains that they are a flourishing class of men, because they have other modes of business—selling goods which may or may not have been pledged, and lending money on private agreement for sums not regulated by the Pawnbrokers Act. Sir Thomas Henry, the chief magistrate of the police courts, has had thirty years experience of the working of the Act. He objects decidedly to the three objects of the Bill—viz., to alter the rate of interest, to enable them to make special contracts, and, thirdly, to shorten the time for forfeiting pledges from twelve to six months; and he gives very good reasons for his objections. He would limit the lowest amount advanced on a pledge to half a crown, and where a pawnbroker has behaved ill, would have his licence backed by a magistrate, with the view of its eventual forfeiture for gross offences.

The account given of Scotland by the witnesses is most melancholy—increase of drunkenness and of crime, which a legal witness attributes to the colonization of Irish and facilities of poor-law relief; yet no able-bodied men are entitled to relief in Scotland.

Circular to Gas Companies.

In this number we are able to give our usual abstract of the accounts of the thirteen metropolitan gas companies for year 1869, exhibiting in a concise form the details of income and expenditure, and the increase or decrease in the several items of account. The accounts again show a steady increase of business and of profit, the increase on the total gas-rental being largely in excess of the amount in 1868. This excess is shared by all the companies, the Imperial and the Phœnix naturally showing the largest proportions. There is in five cases a decrease in the income from public lights, which is not in all cases to be readily explained. In the eight other cases there is a small increase; but on the whole the balance shows a decrease of £2569 on public lights. Taking the aggregate, products appear to have risen somewhat in value; but there is still a decrease in eight cases, and an increase in only five, while the balance shows a total decrease of £12,544. The decrease under this head in 1868, as compared with 1867, amounted to the large sum of £33,908. In the item of charge of coals, &c., there is in general a very considerable decrease; but this is very nearly balanced by a large increase in the case of the Imperial and Western Companies, so that, on the whole, the decrease amounts to but £4371.

The following is an abstract showing the aggregate increase and decrease, compared with 1868, of the income and expenditure of the thirteen companies for 1869:—

	Increase.	Decrease.
Income.		
Total gas-rental	£125,832	..
Common gas	109,933	..
Cannel gas	18,468	..
Public lights, including lighting and contracts	..	£2,569
Meter-rents	1,391	..
Old materials	..	462
Products	..	12,544
Miscellaneous	4,346	..
Total income from all sources	118,564	..
Income and Expenditure, showing Profit Realized.		
Total expenditure on revenue account	..	12,741
Gross profit	131,306	..
Capital and borrowed moneys	429,911	..
Gross profit per cent. on capital and borrowed moneys (average)	0·58	..
Gross profit per cent. on the gas-rental (average)	3·25	..
Expenditure.		
Coals, including carriage and dues	..	4,371
Purifying materials	4,810	..
Supervision, labour, &c.	..	19,245
Repair and maintenance of premises, tools, &c.	..	17,382
Rents, rates, and taxes	5,434	..
Salaries	..	15,048
Collectors commission	785	..
Stationery, printing, and general charges	..	4,533
Directors	806	..
Auditors	25	..
Distribution, expenses, and repair of mains and services	13,817	..
Restoring and replacing meters	55	..
Law and parliamentary charges	..	9,588
Bad debts and extraordinary expenses	30,896	..

With but one exception—the Ratcliff—all the companies show an increase in the gross profit per cent. on the gas-rental; and only two—the Chartered and Ratcliff—show a decrease in the gross profit per cent. on capital. It will be seen that the Phœnix now slightly takes the lead of the Equitable in making the highest profit on the gas-rental; the Phœnix realizing 46·06 per cent., and the Equitable, 45·82. The average profit of the thirteen companies gives an increase of 3·25 per cent. on the gas-rental, and 0·58 on the capital. In the item, "Bad debts and extra-"ordinary expenses," our abstract shows a very large increase, which needs some explanation. In previous years four of the companies had been in the habit of deducting bad debts from the gas-rental, and no loss under this head appeared in their accounts. This year these companies add, collectively, £8558 3s. 3d. to the amount. Respecting the large sum of £17,801 19s. 10d., appearing under this head in the accounts of the Chartered Company, it must be mentioned that it includes the cost of the Saville House fire. Under the same heading, too, are included the charges for the gas referees, chief gas examiner, and official auditor for those companies which come under their supervision. The expenses of these are distributed among the companies as follows:—

Chartered (for the year)	£1717	9	8
City of London "	849	10	1
Great Central "	400	8	5
Imperial (half year ending Dec. 31, 1869)	1204	14	0
South Metropolitan " "	181	4	9
Total	£4353	6	11

One very satisfactory feature in the accounts is the large diminution in the law and parliamentary expenses, which last year amounted to only £5590 14s. 9d., as against £15,173 0s. 10d. in 1868. On the whole, then, the accounts represent the metropolitan gas companies in a highly satisfactory and prosperous state.

The report of the Gas Committee of the Corporation of Manchester, and the statement of accounts, are calculated to increase the desire, already so prevalent among Corporations, to get possession of the gas undertakings of their respective towns. Last year the Corporation realized a gross profit of £65,343 10s. 8d., which, after paying interest £16,784 13s. 8d., and liquidating the mortgage debt to the extent of £24,487 6s., left a surplus of £24,071 11s., which was set aside bodily for improvement purposes.

In another column we publish the first portion of some "Notes "on the Theory of Gas-Burners," by Mr. W. Pole, F.R.S., the recently appointed gas referee. Our readers will see that the author announces the discovery of the true law which governs the relation between the quantity of gas consumed and the quantity of light obtained by any given burner. The law enunciated is—

DETAILS OF INCOME, FOR THE YEAR 1869.

ABSTRACT OF DETAILS OF INCOME AND EXPENDITURE, SHOWING THE PROFIT REALIZED.

Name of Company.	Total Gas-Rental.	Common Gas.	Price per 1000 Cubic Feet.	Cannel Gas, 5s.6d. per 1000 Cubic Feet.	Public Lights, including Lighting and Contracts.	Meter-Rents.	Old Materials.	Products.	Miscellaneous.	Total Income from all Sources.	Total Expenditure on Revenue Account.	Gross Profit.	Capital and Borrowed Moneys.	Gross Profit per Cent. on the Capital and Borrowed Moneys.	Gross Profit per Cent. on the Gas-Rental.
	£ s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.		
Chartered	280,658 4 0	187,719 18 7	4 0	68,908 14 11	24,029 10 6	4,139 5 0	1141 8 1	42,925 8 6	966 12 1	329,830 17 8	266,900 16 2	62,930 1 6	1,304,036 0 0	4·82	22·42
City of London	109,924 7 5	99,343 7 6	4 0	6,249 1 2	4,331 18 9	None chgd.	73 12 7	18,213 18 11	399 4 10	128,611 3 9	90,282 3 8	38,329 0 1	450,000 0 0	8·51	34·86
Commercial	134,792 4 2	119,510 8 8	4 0	..	15,281 15 6	None chgd.	186 16 2	23,760 5 9	258 8 4	158,997 14 5	106,050 12 8	52,947 1 9	437,230 5 0	12·11	39·28
Equitable	84,537 9 9	67,925 1 7	4 0	9,989 13 5	6,622 14 9	1,646 16 10	94 9 1	16,151 16 4	726 15 2	103,157 7 2	64,417 12 10	38,739 14 4	300,000 0 0	12·91	45·82
Great Central	95,094 16 10	85,741 11 6	4 0	..	9,353 5 4	None chgd.	170 7 9	24,855 18 2	39 9 6	119,660 12 3	80,470 1 10	39,190 10 5	266,000 0 0	14·73	41·21
Imperial	572,918 14 4	502,796 5 6	..	..	70,122 8 10	12,088 10 3	..	93,147 12 2	1,651 5 6	679,806 2 3	448,525 15 0	231,280 7 3	2,083,721 0 0	11·09	40·36
Independent	74,720 15 4	68,303 1 8	3 4	..	6,417 13 8	2,409 14 10	223 8 11	18,578 10 6	307 3 1	96,239 12 8	75,377 13 9	20,861 18 11	235,800 0 0	8·84	27·92
London	170,292 16 10	141,051 15 9	4 0	10,243 5 0	18,997 16 1	2,623 13 11	713 8 7	36,884 19 11	1,738 4 6	212,253 3 4	147,642 8 9	64,610 14 7	770,021 0 0	8·39	37·94
Phœnix	198,797 2 8	175,967 4 6	4 0 and 4s. 3d.	..	22,829 18 2	None chgd.	..	44,103 7 5	3,241 18 0	246,142 8 1	154,580 19 5	91,561 8 8	943,296 0 0	9·71	46·06
Ratcliff	33,831 11 6	29,706 7 9	4 6	..	4,125 3 9	7 9 4	30 0 10	7,108 1 10	112 4 3	41,089 7 9	31,321 0 7	9,768 7 2	115,670 0 0	8·44	28·87
South Metropolitan	90,163 2 8	77,757 11 5	3 4 and 3s. 2d.	..	12,405 11 3	None chgd.	165 18 10	22,633 0 10	1,305 18 7	114,268 0 11	82,988 1 11	31,279 19 0	269,723 0 0	11·59	34·69
Surrey Consumers	63,526 18 9	50,466 16 9	4 0	..	13,060 2 0	None chgd.	210 10 0	14,752 12 5	228 2 6	78,718 3 8	53,280 10 5	25,437 13 3	265,960 0 0	9·56	40·04
Western	127,693 7 2	..	..	112,095 15 2	15,597 12 0	3,157 4 5	82 2 6	11,870 4 10	9 5 0	142,812 3 11	100,494 18 8	42,317 5 3	404,730 0 0	10·45	33·14
	2,036,951 11 5	1,606,289 11 2	..	207,486 9 8	223,175 10 7	26,072 14 7	3092 3 4	374,485 17 7	10,984 10 11	2,451,586 17 10	1,702,332 15 8	749,254 2 2	7,846,187 5 0	9·54 Average.	36 78 Average.

DETAILS OF EXPENDITURE ON REVENUE ACCOUNT, FOR THE YEAR 1869.

Name of Company.	Coals, including Carriage and Dues.	Purifying Materials.	Supervision and Labour in Manufacture of Gas.	Ordinary Repair and Maintenance of Premises, Tools, and other Implements.	Rents, Rates, and Taxes.	Salaries.	Collectors Commission.	Stationery, Printing, and General Charges.	Directors.	Auditors.	Expense of Distribution and Ordinary Repairs of Mains and Services.	Restoring and Replacing Meters.	Law and Parliamentary Charges.	Bad Debts and Extraordinary Expenses.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Chartered	149,279 12 3	2,112 12 6	35,291 9 10	18,256 13 0	10,475 19 5	2,954 6 11	3,816 10 1	1,382 10 6	2,826 12 0	163 16 0	15,218 7 8	6,115 9 3	1,204 16 11	17,801 19 10
City of London	49,189 10 3	893 13 10	15,645 14 7	3,399 16 7	2,932 11 1	1,810 16 8	881 13 4	1,970 18 9	1,200 0 0	109 4 0	5,813 5 9	3,964 11 5	164 14 1	2,305 13 4
Commercial	61,759 11 1	2,116 5 1	14,953 3 7	5,056 19 9	3,406 16 9	1,389 10 0	1,360 1 0	1,364 18 10	1,500 0 0	150 0 0	8,129 3 6	2,241 6 9	255 3 11	2,367 12 5
Equitable	37,476 9 8	641 14 6	7,693 18 7	5,446 3 10	2,237 19 1	1,163 0 4	1,078 14 10	858 12 0	1,300 0 0	90 0 0	4,434 11 10	782 3 4	63 12 2	1,210 12 8
Great Central	41,520 13 9	2,430 10 6	11,920 4 2	3,513 19 4	4,373 9 2	1,621 16 10	1,010 14 4	1,493 16 11	1,500 0 0	165 0 0	6,246 12 6	1,795 18 7	1,504 18 9	1,372 7 0
Imperial	267,141 10 3	5,419 5 5	47,337 15 1	45,540 3 0	14,655 8 9	8,808 18 0	8,430 7 5	4,650 3 3	3,250 0 0	157 10 0	28,760 18 3	7,803 14 7	475 5 3	6,094 15 9
Independent	41,813 8 1	898 5 6	11,518 19 8	4,972 9 6	2,932 5 6	1,021 0 0	1,365 18 5	766 14 11	1,669 4 6	100 0 0	5,453 10 4	1,603 11 11	409 19 6	852 5 11
London	75,245 13 10	1,149 18 2	18,549 8 4	20,896 15 2	6,642 1 2	1,058 4 10	2,459 18 3	1,578 6 7	1,500 0 0	100 0 0	10,817 9 2	3,901 3 8	74 18 0	3,668 11 7
Phœnix	82,048 16 4	1,935 1 7	19,323 14 7	20,038 15 5	7,574 13 9	1,370 0 0	2,709 11 4	547 18 19	2,000 0 0	100 0 0	10,901 14 9	2,894 3 3	321 0 6	2,815 9 2
Ratcliff	13,716 0 9	318 18 2	4,647 14 2	6,763 10 0	1,164 14 2	623 10 0	334 10 0	270 7 1	800 0 0	23 12 6	1,894 13 9	31 12 3	..	731 17 9
South Metropolitan	42,794 12 4	1,009 5 4	14,197 15 11	4,389 8 2	3,281 2 9	1,400 19 0	1,246 1 5	1,168 18 1	1,200 0 0	100 0 0	9,333 8 0	1,364 14 10	90 9 6	1,411 6 7
Surrey Consumers	31,220 1 5	857 16 2	6,310 11 0	3,247 10 5	2,922 4 9	796 18 6	638 3 6	597 11 7	1,350 0 0	63 0 0	3,7·3 11 5	908 14 0	25 16 2	578 11 6
Western	62,411 1 11	3,298 16 8	12,252 10 8	6,839 8 1	1,948 10 1	1,696 5 0	1,401 7 0	1,092 15 4	1,250 0 0	120 0 0	6,057 6 7	819 4 10	..	1,307 12 6
	954,671 1 11	23,082 3 5	219,583 0 2	148,361 12 3	64,547 16 5	25,715 6 1	26,733 10 11	17,743 12 7	21,345 16 6	1,442 2 6	116,824 13 6	34,226 8 8	5,590 14 9	42,518 16 0

954,671	1	11	23,082	3	5	219,583	0	2	148,361	12	3	64,547	16	5	25,715	0	4	20,000	10	0	7,000	0	0	10,000	0	0	5,000	0	0

METROPOLIS GAS COMPANIES, 1869.

REVENUE ACCOUNT, *compared with that of* 1868, *showing the Increase or Decrease in each Item.*

	Chartered.		City of London.		Commercial.		Equitable.		Great Central.		Imperial.		Independent.		London.		Phœnix.		Ratcliff.		South Metropolitan.		Surrey Consumers.		Western.	
	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.
	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Total gas-rental	14256	..	5241	..	2845	..	5267	..	9329	..	41159	..	2809	..	6368	..	12252	..	1157	..	10941	..	2092	..	12117	—
Common gas	8374	..	5656	..	2650	..	4621	..	9040	..	39829	..	2122	..	6477	..	20425	..	1185	..	7715	..	1838	..	..	—
Cannel ditto	6028	..	..	542	..	..	1216	..	..	..	..	..	..	..	1376	..	..	..	..	..	..	..	..	..	10391	—
Public lights, including lighting and contracts	..	146	128	..	194	..	..	570	290	..	1330	..	688	..	..	1486	..	8174	..	28	3225	..	254	..	1726	—
Meter-rents	..	110	None	chgd.	None	chgd.	22	..	None	chgd.	1125	..	69	..	146	..	None	chgd.	..	1	None	chgd.	None	chgd.	137	—
Old materials	..	95	44	..	186	..	498	..	142	..	..	1668	76	..	617	..	..	..	..	34	52	..	210	..	..	49
Products	1310	..	..	2513	..	1961	788	..	787	..	..	6758	..	1987	..	1659	..	1908	249	..	2203	..	..	745	..	350
Miscellaneous	..	117	206	..	..	378	620	..	21	..	1591	..	..	652	1732	..	1214	..	24	..	..	108	185	..	9	—
Total income from all sources	15434	..	2979	..	691	..	6568	..	10279	..	35448	..	315	..	7206	..	11558	..	1394	..	13089	..	1743	..	11863	—
Ditto expenditure on revenue account	3547	..	..	4383	..	7043	..	31	1409	..	..	20323	..	2434	1663	..	..	2974	4373	..	7833	..	..	119	5741	—
Gross profit	11888	..	7363	..	7734	..	6599	..	8870	..	55771	..	2749	617	5542	..	14532	..	..	2979	5255	..	1861	..	6121	—
Capital and borrowed moneys	334036	..	..	6625	..	..	..	..	..	..	42989	..	6700	..	..	4365	17892	..	..	..	19723	..	..	1200	20662	—
Gross profit per cent. on capital, &c.	..	0·44	1·73	..	1·77	..	2·20	..	3·84	..	2·49	..	0·94	..	0·77	..	1·39	..	..	2·58	1·19	..	0·74	..	1·03	—
Ditto ditto on the gas-rental	3·26	..	5·28	..	5·02	..	5·28	..	5·86	..	7·36	..	2·74	..	1·91	..	4·77	..	..	10·13	1·84	..	1·67	..	1·83	—

METROPOLIS GAS COMPANIES, 1869.

EXPENDITURE, *compared with that of* 1868, *showing the Increase or Decrease in each Item.*

	Chartered.		City of London.		Commercial.		Equitable.		Great Central.		Imperial.		Independent.		London.		Phœnix.		Ratcliff.		South Metropolitan.		Surrey Consumers.		Western.	
	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.
	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
Coals, including carriage and dues	..	7291	..	2833	..	5111	..	889	..	236	9475	..	..	2679	..	1539	..	1660	..	615	..	875	131	..	5948	—
Purifying materials	..	626	41	..	401	..	336	..	1156	..	132	..	569	..	975	..	686	..	..	63	536	..	521	..	246	—
Supervision, labour, &c.	3661	..	..	611	..	5104	33	..	..	236	..	6532	..	5082	..	4120	..	1298	..	1825	5600	..	..	3449	..	240
Repair and maintenance of premises, tools, &c.	..	1554	..	1799	..	819	..	477	432	..	29201	..	1470	..	5008	..	5694	..	5501	..	993	..	302	..	..	2875
Rents, rates, and taxes	..	1702	57	..	..	60	483	..	2674	..	..	998	12	..	..	479	3381	..	..	144	1295	..	456	..	459	—
Salaries	..	6981	..	394	..	1424	..	696	205	..	378	..	..	419	..	2635	..	1027	..	187	..	1056	..	328	..	484
Collectors commission	51	..	..	39	..	6	75	..	16	..	..	121	85	..	261	..	279	..	5	..	102	..	13	..	65	—
Stationery, printing, and general charges	..	818	766	..	..	254	112	..	..	558	..	22	..	258	..	859	..	2194	..	186	..	178	..	205	112	—
Directors	..	..	..	..	..	..	..	..	..	..	750	..	..	31	..	38	..	..	..	..	..	..	..	150	..	—
Auditors	..	..	..	..	..	..	..	..	31	..	..	..	..	..	..	3	..	..	..	8	..	..	..	..	..	—
Distribution and repair of mains and services	2493	..	391	..	3425	..	974	..	..	2780	4561	..	4190	..	2799	..	..	6901	1608	..	8	..	2824	..	223	—
Restoring and replacing meters	..	344	278	..	1	..	..	448	..	282	1310	..	391	..	438	..	358	..	21	..	..	629	479	..	..	417
Law and parliamentary charges	946	..	..	1762	..	458	745	..	267	..	..	2144	..	358	..	1875	..	1548	..	246	..	1126	..	670	..	844
Bad debts and extraordinary expenses	15710	..	1520	..	2367	..	..	1210	723	..	2086	..	..	225	3668	..	1358	..	510	..	1411	..	7	..	549	—

"That during the normal state of action of a gas-burner the "light given varies directly as the consumption, *minus a certain* "*quantity*," which is constant for the same burner. The train of reasoning which has led to the discovery is of the highest interest, and will command the earnest attention of our mathematical readers, who will look with much curiosity for the proofs of the theorem.

In this number we also publish the conclusion of Professor Rood's paper "On the Amount of Light transmitted by Plates of "Polished Crown Glass at a Perpendicular Incidence." One point in the paper will attract the attention of our readers—viz., the determination of the average sensitiveness of the eye in making photometric observations.

A communication from Mr. Rutter, which we print in another place, describes and advocates the use of a gas fire. The special recommendation of the arrangement described by the author is the perfect exclusion of the products of combustion, or the more disagreeable products of imperfect combustion, from the room warmed by the fire. Little application, however, we fear, is likely to be made of Mr. Rutter's gas fire, since he is candid enough to state that it costs more than twice as much as a coal fire. In cases where the latter is inadmissible, or expense of no importance, the arrangement described may be recommended.

Communicated Article.

NOTES ON THE THEORY OF GAS-BURNERS.

By Wm. Pole, Esq., F.R.S., Mem. Inst. C. E.

No. 1.

I venture to submit the following, in continuation of several articles which I have had the honour of contributing to the Journal of Gas Lighting, on the application of theoretical principles to practical gas questions.

It has often appeared to me that the subject of Gas-Burners deserves more theoretical attention than it has yet received. I need hardly say what an interesting subject this is. From the first introduction of gas, the mode of burning it has formed an essential topic of study; and within the last few years, since burners have figured prominently in gas legislation and gas politics, the questions connected with their construction and action have become more important than ever. And yet one has only to look at the latest and most authoritative essays on the subject (take for example the Gas Referees' Report of June, 1869, and Mr. Heisch's later paper in the Journal of August last) to see in what obscurity these questions still lie.

The study of gas-burners may be treated in three ways. It may be undertaken by the practical mechanician, who may, by careful and patient experiment, endeavour to find out the conditions most favourable for the practical consumption of gas in burners of different kinds. Mr. Sugg's successful labours, for example, illustrate favourably this kind of burner-study.

Secondly, it may be undertaken by the chemist, who endeavours to explain and work out the phenomena of burners by the chemical laws of combustion. This has been partially taken in hand by many eminent men, but it appears to me that a thorough chemical investigation of the subject is yet a desideratum, and might profitably occupy some of the numerous talented chemists among us at the present day.

Thirdly, the phenomena of burners may be studied by the mathematician or the engineer, in regard to the relations which, on mechanical principles, ought to exist between the various quantities entering into their action. This branch of the subject has, unfortunately, been almost entirely neglected, and it is to this, or rather to some points of it, that I propose to direct attention.

There are many elements entering into the action of a gas-burner, among which the following are probably the most important:—

The specific gravity of the gas.

Its illuminating power.

The pressure which causes the issue of the gas (and which is generally taken as near as may be to the point of ignition).

The quantity of gas issuing in a given time.

The dimensions of the flame.

The quantity and intensity of the light produced.

The construction and dimensions of the burner employed.

Now, it will be obvious that some kind of relations ought to exist between these various elements; and it is the investigation of these relations, according to known mechanical laws, and their reduction to definite principles, which constitute the branch of burner-study am now considering.

The investigation of the whole of these relations offers a wide field for research. I may probably go into various branches of it from time to time; but at present I propose to confine myself to a small, yet a very important point—one which has been hitherto involved in much obscurity, and which has often been discussed or alluded to in these columns—namely,

The relation between the quantity of gas consumed in a given burner and the light produced thereby.

Suppose, for example, that in an Argand burner of a given pattern, quantities of the same gas are consumed—varying, say, from 2 to 5 or 6 cubic feet per hour—what amount of light will be produced by each rate of consumption? and what relation will this amount bear to the quantity of gas consumed?

This might be supposed to be a simple matter, capable of easy determination; and its importance is self-evident, as the relation in question not only bears materially on the economic and effective application of burners for ordinary use, but lies at the very root of their adaptation for photometric purposes. And yet, so far as I can learn, no determination of this relation, which can be received as even approximately correct, has yet been proposed.

The most natural assumption, in default of experimental information, would be that the light would vary directly *as* the consumption; for there would appear, at first sight, no *à priori* reason why 4 feet of gas perfectly consumed in one burner should give a different result from the same quantity consumed in two burners; the amount of light-giving material used being in each case the same. This assumption appears to have been taken for granted in the earliest experiments on gas, and even now it is often tacitly adopted in photometrical reasoning

But experiment does not bear out this assumption, as was shown as early as 1825, by Drs. Christison and Turner, in a paper printed in vol. xiii. of the "Edinburgh Philosophical Journal." This is an admirable essay, which treats the subject of burners in a thoroughly philosophical manner; and it is worthy of attentive study by all who are interested in the subject of gas illumination.

The authors point out, by well-conducted and conclusive experiments, that in given burners the light produced increases in a *higher ratio* than the consumption of gas—so that, for example, one Argand burning 4 feet per hour will give more light than two precisely similar burners consuming 2 feet each; and they draw the useful inference that any comparison of the values of different gases, made under the original assumption must be fallacious and inconclusive.

A quarter of a century after Messrs. Christison and Turner wrote, the same facts were again brought forward (probably without any cognizance of their labours) by the late eminent gas engineer, Mr. Alfred King, of Liverpool, who communicated a series of valuable experiments to Mr. Barlow, in illustration of a paper by him on the "Illuminating Power of Cannel Coal Gas." These were published in the Journal of Gas Lighting for 1851.

In 1863 appeared the well-known French researches of Audouin and Bérard, which confirmed the views of the Scotch and Liverpool experimenters, and added considerably to the stock of trustworthy information on the subject.

But though all these authorities fully establish the want of accordance of the actual phenomena with the preconceived assumption, none of them offer any thorough explanation of the fact, or appear to have arrived at any definite idea of the law actually followed by the variation of the light, as compared with that of the consumption.

The first attempt to do this is given in a paper by Professor Silliman, of America, published in the Journal of Gas Lighting of the 18th of January in the present year. He there states a theorem, said to have been discovered shortly before by a Mr. Farmer, photometric observer to the Manhattan Gas Company. This is—*That the intensity or illuminating power of gas-flames varies* (within the ordinary limits of consumption) *as the square of the volume of the gas consumed.*

The experimental proof offered is very meagre, and it is confessed that in many instances the experiments do not coincide with the theory; but it appears, nevertheless, to be adopted by the author of the paper, and it is extended to candles as well as gas-burners, although no experimental justification whatever for such an extension appears to have been obtained. I cannot but think that the theory must have been adopted without due consideration, for it is founded on no sort of intelligible principle. There is no reason offered why any such law should theoretically apply, nor is it easy to conceive any such reason to exist; and from the wide and startling departure of the law from the more natural assumption, it could only be received when justified by the most conclusive experimental evidence.

The paper created, I believe, considerable interest among gas engineers, but the new law was not viewed with favour. Soon after its publication it was powerfully attacked in your Journal, on the ground of its discordance with experimental results; and it may be conclusively shown that when such experiments are sufficiently extended, although they corroborate Christison, Turner, and King's assertion of the departure from the simple proportion, they present no reasonable appearance of conformity to the law of the squares.

In this state of matters it has appeared to me highly desirable to investigate the question anew, and I have conceived this may best be done on the orthodox Baconian principle—namely, by interrogating carefully the experiments themselves, in order to ascertain what tendency they show to conform to any regular law; and, if such tendency appears, then to attempt to discover from it what the law may be. In this way I have arrived at what I venture to offer as (so far as I know) a new solution of the problem.

When two quantities vary contemporaneously, one being dependent on the other by some unknown law, much light may generally be thrown on their mutual relation by the aid of analytical geometry. If a series of results, obtained by careful experiment, are laid down geometrically, according to the method of rectangular co-ordinates, a person accustomed to the analytical properties of curves will soon discover, by carefully testing the general form of the resulting line, whether it shows signs of conformity to any known geometrical figure, and from these signs he will be able to arrive at some idea of the relation required, and to express this in the form of an equation between the two quantities in question.

In addition to this, the geometrical process furnishes a means of forming an opinion on the value of the experiments, and the degree in which they may be relied on. If the resulting curve is

regular in its general tendency, it is probably trustworthy; but if the points in it are erratic, and are obviously incompatible with the law of continuity, they throw doubt on the correctness of the data, or at least on such of them as appear abnormal.

There is further this great advantage in the geometrical mode of analysis, that it enables a judgment to be formed, not on a few isolated cases, but on the general aspect of the whole range of the experiments. I believe the error of Farmer's theorem to have originated in this way. It would be quite possible to pick out of many series of experiments some two quantities which would agree with the law of the squares, or indeed with that of other powers; but when the whole range is collected together, and viewed in its general bearing (as can be done by the geometrical method), the fallacy of the inference from the isolated cases will at once be seen. Indeed, I shall be able to show that the very experiments by which Professor Silliman has endeavoured to prove Farmer's theorem, when viewed in the more comprehensive way, point to a relation of an entirely different character.

As this geometrical mode of analysis is so extensively useful, when properly applied, I may illustrate it by a few examples. Let the two quantities, varying contemporaneously, be denoted by x and y, it being supposed that y bears some definite relation to x, which relation is required to be found.

Suppose we find recorded the following set of experiments:—

Value of x.		Value of y.
0·4	..	5·0
0·8	..	10·1
1·1	..	14·0
1·6	..	18·0
2·0	..	25·0
3·2	..	40·5

Let these be plotted to any convenient scales, and the resulting line examined. The first thing that will catch the eye is that the fourth observation is out of place—it is unconformable to the general range of the others. Hence it is probable that this observation contains some error; and unless it can be checked and revised, it should be expunged from the series. Confining the attention to the others, it will be seen that they form, or at least decidedly *tend* to form, a straight line, passing through the origin of the co-ordinates; and from this fact the law is at once apparent that y varies directly as x, or, in algebraical language, the required relation of the two quantities is expressed by the equation—

$$y = Ax,$$

where A is some constant, easily found.

Again, suppose we have the following experimental series:—

Value of x.		Value of y.
1·5	..	1·8
3·0	..	7·1
4·1	..	13·0
4·8	..	18·2
5·0	..	20·0
6·6	..	34·4

When this is plotted it will form a tolerably regular figure, the second and fourth observations being a little out of the range, but not more than may fairly be attributed to errors of observation. A regular curve may be drawn from the whole, and a geometrician will soon identify this curve as a parabola, with the axis perpendicular to the line of the abscissæ, and the vertex at the origin of the co-ordinates. This reveals the relation required as—

$$y = Ax^2.$$

Thirdly, suppose a set of observations, thus:—

x.		y.
0·5	..	3·75
1·5	..	5·75
3·0	..	7·70
4·1	..	8·82
5·0	..	9·64
6·6	..	10 94

The plotting will show the same kind of curve as the last, but in a different position; the axis being now parallel to the abscissæ, but removed above the point of origin. This declares the relation to be—

$$y = A\sqrt{x} + c,$$

where A and c are both constants, easily found.

By this method, then, I have tested all the best experiments I could find recorded, on the relation between the quantity of gas consumed in any given burner, and the light produced. For some few cases obvious mistakes have been revealed, and in one or two others the results have been anomalous and apparently abnormal; but on the whole I have found sufficient regularity to point to certain principles as generally applicable.

In the first place it is clear that the light does not increase as the consumption; for in this case the *loci* of the various points would be in a straight line, passing through the common origin of the co-ordinates; and in no instance (except one to be hereafter mentioned) is there any sign of this.

Then, secondly, the diagrams obtained do not correspond with Farmer's law of the squares; for in this case the *loci* would form a parabola with its vertex in the origin of co-ordinates; and no appearance is offered of such a figure.

If the light increased according to any other power of the consumption, we should still have a curve, of some description, passing through the origin; but though traces of curvature may sometimes be suspected, they do not conform to any regular rule of this kind.

The form of the figures is singular, and bears unmistakeably a similar general character in all the experiments. With very low quantities, and very high ones, the figure is abnormal and irregular; but there is, for every burner, a certain range, which may be called the *normal range* for that burner, and during which the figure is, allowing for trifling errors of observation, very regular, pointing to a definite relation in this range between the two quantities. The figure here exhibits in all cases a decided tendency to form a *straight line*, but this line *does not pass through the origin*, it cuts the line of the abscissæ (which represent the quantities consumed) at some distance from it, a distance varying with different burners.

This figure reveals the law which governs the relation between the quantities, and it is this:—

That during the normal state of action of a gas-burner the light given varies directly as the consumption, minus a constant quantity.

In algebraical language, let q=quantity of gas consumed per hour in a given burner; and L=light produced thereby.

Then, while according to the original erroneous assumption,

L varies as q,

and according to Farmer's equally erroneous theorem

L varies as q^2,

the true law appears to be

L varies as $(q-c)$,

where c is constant for the same burner.

The principle involved in this law appears to be somewhat as follows. When the quantity of gas supplied to the burner is very small compared to its normal capacity, it is burnt at a disadvantage, having an excess of air; it is, in fact, in the position of a Bunsen burner. Hence, as has been often explained, the deposition of the light-giving particles is impeded, the flame burns blue, and the light developed is smaller than is fairly due to the gas employed. But as more and more gas is admitted, this defect tends gradually to remedy itself, until a point arrives where a normal and proper condition is reached; and *beyond that point every increment of gas gives a corresponding and uniform increment of light.* The quantity of gas necessary to develop this condition in the first instance is represented in our equation by the constant c; and, for want of a better name, I may call it the *developant* for that burner.

This quantity, though constant for the same burner, varies materially for different kinds of burners, and also under other changes of condition. The circumstances which determine its value in different cases, as well as the bearing of the newly discovered relation on the use of burners generally, are matters requiring careful investigation, but I do not purpose to go into them now. It is more important at present to demonstrate the applicability of this law, by showing that it corresponds fairly with almost every series of authoritative experiments obtainable. This I propose to do in my next paper.

(To be continued.)

A GAS FIRE.

A gas fire—what does that mean? Is it a new gas-stove, differing from others in form, or material, or mode of operation? No, it is not a stove; and from the number and variety of such articles, at the present time, it seems scarcely possible to make any further improvements in them. By this I by no means wish it to be inferred that gas-stoves are not susceptible of improvements. Just the contrary; for with only rare exceptions all of them partake of a common defect in construction, and violate every right principle in their operation.

A gas-stove, intended to warm any part of a dwelling-house, a shop, a warehouse, or a public building, should have an exit-flue for conducting away the products of combustion. This is as necessary where gas is employed as fuel for heating, as it is where coal or coke is used in a stove or open grate. Who would think of putting a fire of wood, or coal, or coke in a room where there is no chimney, or at such a distance from the chimney that it could not be made practically available? In hundreds of instances this is exactly what is done when gas is used for warming, although it is so well known that it would be impossible to endure the suffocating effects with other kinds of fuel. Why is this? Because that which is not seen, and its effects immediately experienced, however injurious it may be known or suspected to be, is not objected to like that which is seen and felt to be disagreeable. The smoke from burning wood, and the smoke and sulphurous fumes from coal and coke, are unbearable; but the carbonic acid, the aqueous vapour, and the empyreumatic odour emitted by a gas-stove, being invisible, and not instantly offensive or hurtful, are borne with for weeks and months without complaining.

Let no one suppose that the flame of gas-burners at the usual elevation, and the same quantity of gas consumed in a stove, are alike in their effects upon the surrounding atmosphere and the occupants of the apartment. In actual practice there is a great difference.

In a suitable burner there is perfect combustion, and the flame being above the head, the heated air and chemical products ascend towards the upper parts of the room, and escape at every opening. In a stove the gas is supplied through a ring of small jets, and in that way the gas is not consumed so perfectly as in a burner for yielding light. This is not the principal objection. Think of the different heights at which the heated air and other products are emitted in one case, as compared with the other; from the stove, *below* the respiratory organs, where they must necessarily be inhaled in greater quantities than when *above* them, as from an ordinary burner. Moreover, it must be remembered that the intention of using a gas-stove is to diffuse and retain the heat as much as possible, whilst in lighting with gas the effort is to get rid of the heat as quickly as possible. So it happens that in one process there are favourable conditions and compensating influences which, with ordinary care, make it agreeable and healthful; whilst in the other, with stoves in common use, everything that could be done has been done to produce effects which are both disagreeable and hurtful.

Although ordinary gas-stoves are defective, it must not be con-

cluded that good ones cannot be, or never have been, made. More than 25 years ago I used no others than those with exit-flues, which diffuse radiant heat only, carry off the vapour and chemical products, and cause ventilation in the same way as an open fireplace.

Nor is this the only improvement. During the last twelve winters I have had the enjoyment of warmth from a stove which is entirely isolated as respects the room (private office) in which it is fixed. The air which supplies the means of combustion to the gas-jets is conveyed from outside, under the floor, and through the bottom of the stove; and the exit-flue communicates with the chimney of an adjoining room. By this plan the perfection of warming by gas is attained. I have found it so, for the temperature can be adjusted and maintained without varying one degree for any period required.

By means of a stove constructed on the principle just indicated, a difficulty can be got over which often occasions discomfort, and not unfrequently causes an otherwise useful room to be deserted. For example, where there is no chimney, nor one near enough to be available, a room can be effectually and healthfully warmed, the flue protected by a hood, terminating outside the building. This form of stove is also applicable to bankers strong-rooms, deed and manuscript rooms, where *dry* heat is specially needed.

Why is it that the stoves I have just described are so little known, and that so few of them are in use? Because they are more expensive than common ones, and require more skill in making and attention in fixing.

Now it is time to tell what I mean by a gas fire. It consists of pumice—usually called pumice-stone—broken into tolerably small fragments, laid upon each other to the height of the bars of a fire-grate, and heated to incandescence by gas. The pumice being properly arranged, and the gas properly applied and ignited, in a few minutes there will be a glowing fire. Here will be nothing to disturb our old-fashioned notions about the cheering influences of a fire which can be seen as well as felt. Ventilation by the chimney will go on as from time immemorial, and the habit of sitting near to or far from the fire may still be indulged.

In arranging for a gas fire, the cost of materials and workmanship is very trifling—only a few shillings. The mode of operation being understood, the preparations for ensuring success are extremely simple. In this, as in most other things, there is a right way and a wrong. A few words will be sufficient to describe what I believe to be the right way.

Let us begin by arranging the pumice in the grate. As it is reasonable to suppose that the fire-grate will be proportionate to the dimensions and requirements of the room, we will take, as an example, one whose capacity is about 720 cubic inches (width—front, 18 inches; back, 12 inches; depth, front to back, 8 inches; height, 6 inches). About one-third of the space at the back part of the grate must be filled in solid with fine bricks or lumps, chipped so as to make them fit closely. The pumice should be broken into pieces not exceeding 2 to 2½ inches in diameter, and the greater the number of sharp, irregular, angles there are the better. With these the whole space in front of the grate is to be filled. The pumice must not be thrown in, but carefully packed by hand close to, and between, the bars, and sufficiently above them to cover the fire-bricks at the back, filling the grate completely.*

The next thing to be done is to see about the gas; which must be conveyed to the front or side of the grate, concealing the tubing under the fender, and placing the tap for regulating the supply where it will be conveniently accessible. For a grate of the dimensions I have described, three burners will be required. They are to be made of ⅜-inch brass tubing, each about 2 inches long, pinched together at one end so as to make a flat flame; the other end being screwed into ¼-inch or ⅛-inch tubing of the same kind 15 inches long, one end of which must, of course, be stopped. Each burner must be enclosed in a cylinder of very thin plate iron. It must be 3 inches in diameter, notched round the bottom to allow free access of air, the height depending on the space between the hearth and bottom of the grate. The top of each cylinder must be covered with fine iron wire gauze, making of it what was well known more than 30 years ago as an air or atmospheric burner. In this way a mixture of air with gas is obtained, which burns tranquilly, not vividly, and produces heat, not light. The cylinders are easily fitted upon the ½-inch tubing, by holes in their sides, and kept at proper distances by back-nuts, or pieces of curved iron plate. The burners are then to be screwed in, and the wire-gauze caps fixed. Thus arranged, the burners must be placed under the grate, as near the front as possible, and the wire gauze within half an inch of the bottom.

Light the gas. A yellowish flame will first be seen seeking its way among the interstices of the pumice. The colour will soon change to pale blue, and in about ten minutes the pumice will be all a-glow. If sufficient gas be admitted, this will increase until the contents of the grate are at a white heat. When the fire-bricks have been thoroughly heated the incandescence will proceed more quickly.

This is a gas fire. It can be lighted and put out in an instant, or always kept burning; and the heat from it increased, diminished, and so exactly regulated as to suit the requirements of seasons, of temperatures, of sizes of rooms, the number of persons present, the variations in constitutional habits, and almost every conceivable phase of likes and dislikes about heat and cold which occur in every-day life. It is a fire that requires no watching, that will not only keep burning, but may be left for hours in a shut-up room with perfect safety. It saves time and labour of servants, causes no smoke, dust, or noise; and whilst applicable to general purposes, is specially adapted for sick chambers, bed-rooms, nurseries, private offices, and libraries.

Many things which are relatively dear are, in actual cost, comparatively cheap. Fuel is a touchy subject, and naturally so, for it is in many thousands of families an important item. The first question likely to be asked, in respect to a gas fire, will be—Does it cost more than a coal fire? Yes; it does. By careful experiments I have ascertained that if we take coal of good quality at 25s. per ton, and gas at 3s. 6d. per 1000 cubic feet, the cost of a coal fire, in a grate of the dimensions I have already quoted, will be one halfpenny per hour, and that of a gas fire one penny and one-sixth of a penny per hour.

No one will deny that there are many comforts and securities, many conveniences and elegancies, which are not reckoned by their cost. If need be, some could be done without, and for others various substitutions could be made at greatly reduced costs. Somewhat in this way must we look at the difference between a gas fire and a coal fire. The figures I have set down for their comparative cost must be taken as representing a continuous fire, the best of each kind during a certain number of hours, the coal used being weighed and the gas measured.

What a number of disagreeables attendant upon a coal fire could be enumerated if we were to set about it! There is cleaning the grate, taking away the ashes, a periodical sweeping of the chimney, and the cost of wood for lighting fires. Then we are often set thinking by the coldness of the room, after the fire has been some time lighted, the attendance required, and the going down and reviving, and, if neglected or forgotten, the going out and re-lighting.

With a gas fire there is a wide margin for economizing; for one-half the quantity of gas included in my estimate would keep a room comfortably warm and well ventilated until more heat was required. So also it need scarcely be mentioned that for a smaller grate two burners would be sufficient; and for a still smaller, one burner, thus reducing the cost.

One word of caution is necessary. Never attempt to cure or get rid of the annoyance of a chimney with down-draught (what is commonly called a smoky chimney), by applying to it a gas fire. If the smoke, vapour, and chemical products from a coal fire refuse to go the right way, depend upon it those from a gas fire will be as disobedient.

J. O. N. R.

Black Rock, Brighton, Oct. 20, 1870.

* The pumice without any coloured marks or stains is the best. It is not literally, but as nearly as possible practically, indestructible.

Miscellaneous News.

THE QUALITY OF THE GAS SUPPLIED TO LONDON.—Dr. Letheby, the chief gas examiner appointed by the Board of Trade, has recently reported to the Corporation of London and to the Metropolitan Board of Works on the quality of the gas supplied by the Chartered, the Great Central, the City of London, the Imperial, and the South Metropolitan Gas Companies, from which it appears that the average illuminating power of the common gas has ranged from 15·68 standard sperm candles, in the case of the Imperial gas, at the testing-place at Camden Town, to 18·34 candles in that of the Great Central gas. The average quality of the gas at each of the testing-places during the quarter has been as follows:—Great Central gas, at Friendly Place, 18·34 candles; City of London gas, at Cannon Street, 17·37; Chartered gas, at Leadenhall Street, 17·64; ditto, at Gray's Inn Lane, 16·93; ditto, at Arundel Street, Haymarket, 16·66; Imperial Gas at Chelsea, 16·29; ditto, at Camden Town, 15·68; and the South Metropolitan gas, at Peckham, 15·90. The average quality of the cannel gas has been 25·87 candles in the case of the City Company's gas, and 25·07 in that of the Chartered Company. As regards impurities, Dr. Letheby reports that the gas of all the companies has been constantly free from sulphuretted hydrogen, but that the amount of sulphur in other form than this has fluctuated to a very large extent, for while the average amount of this impurity was only 13·28 grains per 100 cubic feet of the City Company's cannel gas, it amounted to 34·69 grains per 100 cubic feet of the South Metropolitan gas. The average proportion of sulphur in the gas of each of the companies during the quarter was as follows:—City Company's cannel gas, 13·28 grains per 100 cubic feet; ditto, common gas, 21·84 grains; Great Central gas, 21·19 grains; Chartered gas, at Leadenhall Street, 22·97 grains; ditto at Gray's Inn Lane, 27·87 grains; ditto at Arundel Street, 28·45 grains; Imperial gas, at Chelsea, 30·35 grains; ditto at Camden Town, 24·03 grains; and South Metropolitan, 34·69 grains. According to Dr. Letheby, these large differences are entirely due to the different processes of manufacture and purification, and they indicate the means of reducing the serious impurity to the smallest amount. Ammonia has not been present in excessive quantity in the gas of any of the companies, except the Chartered, and it was only in excess in the gas of that company on the several days from the 12th to the 25th of July last, when it arose from accidental circumstances over which the company had no control.

LONDON GASLIGHT COMPANY.

The Ordinary Half-Yearly Meeting of the Shareholders of this Company was held at the Freemasons Tavern, on Wednesday, Oct. 12—J. R. HALL, Esq., the governor, in the chair.

The SECRETARY (Mr. A. J. Dove) having read the notice convening the meeting, and the corporate seal having been affixed to the register of shareholders, the following report and statements of account were presented:—

Annexed to this report your directors submit to you the half-yearly accounts, showing the result of the manufacture and distribution of the company's gas up to the 30th day of June last. After appropriating £750 to the redemption-fund, in accordance with the provisions of the London Gaslight Act, 1857, the sum of £34,413 17s. 11d. remains applicable to dividend. Out of that sum the directors recommend that dividends be declared upon all classes of preference shares and stocks, and a dividend of £2 10s. per share on the ordinary shares which were paid up in full on or before the 30th day of June last. Such dividends to be paid on the 13th of October.

The accounts are presented in the form prescribed by the Board of Trade.

Your directors have the satisfaction of informing you that the reduction in the price of gas to the public, announced in the last report, has been justified by the results. The rental for gas has scarcely suffered any diminution, and the increased expenditure for coal and wages consequent upon the supply of the additional quantity of gas has been more than met by the receipts for the other products of manufacture.

Of the amount standing to the credit of the reserved fund, £5565 has been invested in Government stock.

Certain shares upon which calls long since due have remained unpaid having been declared forfeited by the board, it is intended to submit a resolution to the meeting to confirm such forfeiture.

Mr. Richard Deeley, one of your auditors, has resigned his office of auditor, his failing health compelling his retirement. The vacancy may, if the shareholders think fit, be filled up at this meeting.

THE LONDON GASLIGHT COMPANY.

Half Year ended June 30, 1870.

A.—STATEMENT OF SHARE CAPITAL, *on June* 30, 1870.

1. Acts of Parliament authorizing the Raising of Capital.	2. Description of Capital.	3. Maximum Dividend authorized.	4. Number of Shares issued.	5. Nominal Amount of Share.	6. Called up per Share.	7. Total paid up.	8. Amount issued but not paid up.	9. Remaining to be issued.	10. Total Amounts authorized.
15 Vict., cap. 82	Ordinary	10 per cent.	7246	£50 0 0	£50 0 0	£359,816	£2,484	..	£397,150
	2nd preference.	6 ditto.	449	50 0 0	50 0 0	22,000	450	£50	
	3rd ditto	6 ditto.	155	50 0 0	50 0 0	7,750	..	4,600	
	1st ditto.	6 ditto.	5610	25 0 0	25 0 0	140,250	..	9,750	150,000
29 Vict., cap. 55	A ditto	6 ditto.	7622	25 0 0	10 0 0	125,655	66,895	109,450	300,000
20 & 21 Vict., cap. 73	Debenture stks.	5 & 6 ditto.	Stock.	Stock.	All.	28,538	..	..	28,538
						£682,009			

B.—STATEMENT OF LOAN CAPITAL, *on June* 30, 1870.

1. Acts of Parliament under which borrowed.	2. Description of Loan.	3. Rate per cent. of Interest.	4. Total Amounts borrowed at June 30, 1870.	5. Remaining to be borrowed.	6. Total Amounts authorized.
15 Vict., cap. 82	Bond, &c.	4½ and 5.	£85,412	£10,862	£101,417
29 Vict., cap. 55	Ditto	..	..	100,000	100,000

Total share capital paid up (*see* A), £682,009; ditto loan ditto borrowed (*see* B), £85,412; total capital received, £767,421.

C.—CAPITAL ACCOUNT, *for the Half Year ended June* 30, 1870.

Dr. *Cr.*

	Total to June 30, 1870.		Certified Receipts to Dec. 31, 1869.	Received during Half Year.	Total Receipts to June 30, 1870.
To Expenditure, to Dec. 31, 1869	£733,158 6 10	1. By Ordinary shares, £50 each	£359,516 4 9	..	£389,566 4 9
Less—		2. 2nd pref. shares, £50 each	22,300 0 0		
Excess in wear and tear of retorts and in pipes returned to store £138 3 2		3. 3rd ditto, £50 each	7,750 0 0		
Ditto in meters returned to store 227 11 9	365 14 11	4. 1st ditto, £25 each	140,250 0 0	..	140,250 0 0
	732,792 11 11	5. A ditto, £25 each, including amount received in anticipation of calls	123,605 0 0	£50 0 0	123,655 0 0
Balance, Dec. 31, 1869	24,188 7 6	6. Debenture stocks, under 20 & 21 Vict., cap. 73	..	..	28,538 7 6
Total expenditure	756,980 19 5	7. Bonds and other loans	..	..	85,412 0 0
To balance of capital account	10,440 12 10				
	£767,421 12 3				£767,421 12 3

D.—REVENUE ACCOUNT, *for the Half Year ended June* 30, 1870.

Dr. *Cr.*

To Manufacture of gas—			By Sale of gas—		
1. Coals, including dues, carriage, unloading, and all expenses of depositing same on works	£38,157 4 0		1. Common gas (367,286,900 cubic feet), at 3s. 9d. per 1000 cubic feet	£68,866 5 10	
2. Purifying materials, oils, water, and sundries at works	299 17 5		2. Cannel gas (20,391,500 feet) at 5s. 6d. per 1000 cubic feet	5,607 13 3	
3. Salaries of engineers, including chief engineer, superintendents, and officers at works	1,327 2 0		3. Public lighting and under contracts	9,596 17 11	
4. Wages and gratuities at works	8,477 17 4				£84,070 17 0
5. Repairs and maintenance of works and plant (including renewal of retorts), machines, apparatus, tools, materials, and labour	5,418 6 5		4. Rental of meters		1,762 11 2
	53,680 7 2				85,833 8 2
Less old material sold	179 0 4		Residual products—		
		53,501 6 10	5. Coke, less labour and cartage	15,742 3 5	
Distribution of gas—			6. Breeze	424 15 2	
6. Salaries of surveyor, chief inspector, inspectors, assistant inspectors, and clerks in Light Office	1,394 10 0		7. Tar	2,990 2 5	
7. Repair, maintenance, and renewal of mains and of service-pipes, including materials, laying and paving, and labour	2,440 12 0		8. Ammoniacal liquor	1,068 10 1	
8. Repairing, renewing, and refixing meters	1,622 11 0				20,225 11 1
		5,457 13 0	9. Rents		843 13 9
Public lamps—			10. Transfer fees		8 12 6
9. Lighting and repairing		1,330 7 1			
Rents, rates, and taxes—					
10. Rents	957 19 0				
11. Rates and taxes	2,692 6 6				
		3,650 5 6			
Management—					
12. Directors allowances	750 0 0				
13. Salaries of secretary, accountant, and clerks, office-keepers, and messengers	579 18 0				
14. Collectors commission and salaries	1,635 0 4				
15. Stationery and printing	301 12 0				
16. General establishment charges and incidentals	299 2 6				
17. Company's auditors	50 0 0				
		3,615 12 10			
Law and parliamentary charges—					
18. Law	98 16 11				
19. Parliamentary (*oppositions*)	18 8 1				
		117 5 0			
20. Depreciation-fund for works on leasehold lands		100 0 0			
21. Bad debts		864 8 1			
22. Repairs of houses		150 9 4			
Total expenditure		68,787 7 8			
Balance carried to profit and loss account (E)		38,123 17 10			
		£106,911 5 6	Total receipts		£106,911 5 6

E.—PROFIT AND LOSS ACCOUNT (NET REVENUE), *for the Half Year ended June* 30, 1870.

Dr. *Cr.*

1. To Amount carried to reserved fund account (F) from profits, to Dec. 31, 1869	£1,930 12 3	1. By Balance of net profit brought from last account	£29,446 3 9	
2. Interest on temporary loans and bonds	3,229 2 5	Less dividend paid for the half year ended Dec. 31, 1869	27,515 11 6	
3. Redemption-fund, reserve per London Gaslight Act, 1857	750 0 0			£1,930 12 3
Balance of net profit to be carried to next account, subject to half year's dividends	34,413 17 11	2. Balance brought from revenue account (D), being profit for the half year, to June 30, 1870		38,123 17 10
		3. Interest on moneys deposited		269 2 6
	£40,323 12 7			£40,323 12

F.—RESERVED FUND ACCOUNT, *for the Half Year ended June 30, 1870.*

Dr.		*Cr.*	
To Balance	£6,156 17 1	1. By Balance brought from last account	£4,226 4 10
		2. Amount brought from profit and loss account (E)	1,930 12 3
	£6,156 17 1		£6,156 17 1

G.—DEPRECIATION-FUND ACCOUNT (for Works on Leasehold Lands), *for the Half Year ended June 30, 1870.*

Dr.		*Cr.*	
To Balance	£300 0 0	1. By Balance brought from last account	£200 0 0
		2. Amount brought from revenue account (D)	100 0 0
	£300 0 0		£300 0 0

H.—STATEMENT OF COALS, *during the Half Year ended June 30, 1870.*

Description of Coal.	In Store, Dec. 31, 1869.	Received during Half Year.	Carbonized or used during Half Year.	In Store, June 30, 1870.
	Tons.	Tons.	Tons.	Tons.
Common	1,274·4	51,940·0	47,171	6,043·4
Cannel	735 6	2,740·1	3,203	272·7

I.—STATEMENT OF RESIDUAL PRODUCTS, *for the Half Year ended June 30, 1870.*

Description of Residual.	In Store, Dec. 31, 1869. Estimated.	Made during Half Year. Estimated.	Used in Manufacture during Half Year. Estimated.	Sold during Half Year.	In Store, June 30, 1870. Estimated.
Coke— Common—chaldrons of 36 bushels	1,850	47,325	10,079	38,971	325
Cannel—ditto					
Breeze—chaldrons	345	4,972	619	4,458	240
Tar—gallons	126,000	449,000	..	466,000	109,000
Ammoniacal liquor—butts of 108 gallons	1,741	5,715	..	6,669	787

J.—GENERAL BALANCE-SHEET, *on June 30, 1870.*

Dr.			*Cr.*		
1. To Capital account— Balance at credit thereof (Account C)	£10,440 12 10		1. By Cash at bankers and in hand		£14,526 19 1
2. Profit and loss account— Balance at credit thereof (Account E)	34,413 17 11		2. Ditto on deposit or at interest		25,000 0 0
3. Reserved fund account— Balance at credit thereof (Account F)	6,156 17 1		3. Coals—for stock on hand	£4,645 19 7	
4. Depreciation-fund account (for works on leasehold lands)— Balance at credit thereof (Account G)	300 0 0		4. Coke and breeze—ditto	170 5 0	
5. Redemption-fund	3,214 5 6		5. Tar and other products—ditto	929 2 0	
6. Unpaid dividends	2,292 4 7		6. Sundry stores—ditto	3,066 11 3	
7. Interest accrued and unpaid on bonds and other loans	1,063 4 6				8,811 17 10
8. Sundry tradesmen and others, for amount due for coals, stores, &c.	34,283 10 3		7. Gas and meter rental—balance of this account due to the company, less deposits and prepayments	31,005 9 8	
			8. Coke and other residuals—balance of these accounts due to the company	6,379 11 9	
			9. Sundry accounts	875 14 4	
					38,260 15 9
			10. Investment account		5,565 0 0
	£92,164 12 8				£92,164 12 8

The GOVERNOR: Gentlemen, it becomes my duty now to move the adoption of the report, but before doing so I would just call your attention to the present state of this company. It is now upwards of 23 years since I was solicited by the then existing board to take part in the management of the affairs of this company, and during the period which has elapsed I have been certainly intimately acquainted with those affairs, though not all the time a director. I believe that at no period since the time I allude to up to the present day have the directors been able to come before you under such favourable circumstances as they appear before you in the report just submitted to your notice. Gentlemen, you are all aware that a few years ago we were visited with considerable agitation in the gas world. Since that agitation ceased we have been enabled to direct our undivided attention to the best mode of producing and distributing gas to the public at the lowest possible cost. We announced to you at the last meeting that we had reduced the price of gas from 4s. to 3s. 9d. per 1000 cubic feet from the 1st of January this year. No doubt that was to an extent an experiment, and when we met you in April we were not quite prepared to tell you what the effect of that reduction would be. If I recollect right, it was then suggested in this room that we might have reduced the price rather too soon. However, be that as it may, we have much pleasure in informing you that the diminution in the gas-rental last half year, as compared with the corresponding period of 1869, is a very inconsiderable amount—a mere nothing—and the increased consumption has met that reduction. There has been, of course, an increased expenditure in coal and wages to procure the additional quantity of gas that has been consumed, but fortunately during the past year the increased receipts for products and manufactures have gone greatly to meet that extended cost. Well, gentlemen, with these figures before you, I may now add that, although the company is enabled to put by a sum of money for a reserve-fund to meet contingencies, if any such should arise, before making a reduction in the price of gas, we still thought it our duty to give the public the benefit of any reduction we could at the earliest possible period. We look to ourselves while looking to the public; we cannot, indeed, look to the interests of the one without seeing that it works in harmony with the other; and therefore I am happy to state that, while we believe your property is in a safe and secure position, we shall, after the resolution I shall presently propose for the distribution of the usual dividend, have a sum of about £7000 in hand, from the profits of the last half year, to add to the reserve-fund already created. The question of reserve has not occupied the attention of this company so early as it might have done, nor as it has occupied the attention of other companies, in consequence of our feeling that a very large expenditure—possibly a useless expenditure—at all events an expenditure not representing value in the present day, had been incurred; but now we feel justified in putting by such a sum as may be necessary to meet any sudden contingency which it is not impossible may arise in connexion with an explosive manufacture, such as gas is. We trust we shall meet with your approval as to the course we have hitherto adopted, and are now adopting. Having said thus much, there is really very little more for me to add, for the report gives you all necessary information in respect to the position of our affairs. I may say, however, that we are living in amity with our neighbours—I speak particularly of the Equitable Company—who surround us. We have made an arrangement with the Equitable Company during the past half year, which we conceive will be very beneficial to them as it will be to ourselves. You are possibly aware that we have been manufacturing and distributing cannel gas as well as common coal gas. In our communications with the Equitable Company we found we could make a satisfactory arrangement with them to supply us wholesale with cannel gas, and give them the use of our gasholders at Vauxhall at a rental, with the view of discontinuing our establishment there, and centralizing our business at Nine Elms—an arrangement which we consider very beneficial to them as it is to us. But beyond that it is of importance for companies working close—working nearly in the same locality—to work in amity one with the other. We have been in communication recently with the directors of the Equitable Company. We can shake hands cordially, and in anything we can assist each other we think it right to do it. Gentlemen, that is, I believe, nearly all I have to say to you on the subject of the report. I shall propose a resolution presently that certain shares which have been standing more than 20 years with calls due upon them be forfeited—all the requirements of the law having been completed for that purpose—the object being to enable us at our next half-yearly meeting to submit to you a proposition for the conversion of our share capital into stock. At the present moment it is absolutely necessary to keep the number of every share registered, which is a great inconvenience, and involves an expenditure of time and labour in the office, which we think may be saved. We shall then be able to give each proprietor a certificate of the amount of his stock, any portion of which he can sell, whenever so disposed. But we cannot convert our shares into stock till all the calls are paid up. In forfeiting the shares I referred to, we are not doing any injury to the persons in whose names they have stood in our books for upwards of 20 years, and it will be a great convenience to us. The matter has been standing over from time to time, but as latterly there has been peace in the gas world, we have had more time to pay attention to the internal arrangements, and this is one, the completion of which will I hope take place at the next meeting of the proprietors. In the meantime it is necessary to clear our books of these shares, and I shall propose a substantive resolution on the subject before the close of this meeting. Since our report was drawn up the question of the salary paid to our secretary, Mr. Dove, has come before the consideration of the board. The amount of that salary rests with the proprietors. Mr. Dove had been in the service of the company for many years as accountant, and when the vacancy occurred in the office of secretary, the directors, having pondered the subject well, resolved unanimously to give him the appointment. But they have no power to give him any salary whatever, and it rests with the shareholders to sanction the amount which he shall receive. It has only been taken into consideration by us since the report was issued—it was not necessary, probably, that it should be referred to them—and I only mention it now that, when the other business of the meeting is transacted, you may be prepared to give your attention to the question. His present salary is £500 a year, but looking at the amount of capital involved in this company, and the consequent responsibility which devolves on him, remembering also that he has been so long in our service, we think it right to submit a resolution on the subject for your consideration, it being, as I stated, a question which rests entirely with you. With these observations, I beg leave to move—"That the report of the directors, and the accounts now laid before the meeting, be received and adopted."

The DEPUTY-GOVERNOR (Mr. Rhode Hawkins) seconded the motion.

The GOVERNOR, in reply to Mr. Rhodes, said he hoped the company had done with parliamentary expenses for the present. The amount of bad debts was certainly rather heavy. Many of the accounts which formed this item had been standing for some years, and the directors had employed an additional collector to get them in. He was happy to state that the amount was being reduced.

Mr. FORD said that as he was the proprietor who at the last meeting ventured to doubt the policy of reducing the price of gas, he was very happy now to express an opinion that the policy of the directors in the matter was a successful one. Having carefully examined the report, he pronounced it extremely satisfactory.

The motion was put, and carried unanimously.

The GOVERNOR moved, and the DEPUTY-GOVERNOR seconded, the next resolution, which was also unanimously adopted—viz., "That the following dividends be declared:—The fixed dividends upon all classes of preference shares and stocks,

and a dividend of £2 10s. per share on the ordinary shares which were paid up in full before the 30th of June last, payable on the 15th inst."

A formal resolution confirming the forfeiture of the shares referred to by the governor was adopted.

Mr. Hugh Oxenham was appointed an auditor of the company, in the room of Richard Deely, Esq., resigned.

Mr. RHODES proposed, pursuant to notice given at the last meeting—"That the remuneration of the directors be increased £300 per annum from the 30th of June last."

Rev. R. H. WEBB seconded the motion, which was carried unanimously.

The GOVERNOR said he need scarcely say that the directors received this resolution of the meeting with unmixed pleasure, because they felt it had emanated from the confidence which the shareholders entertained in reference to their management of the affairs of the company. He could only assure them that the board had always been ready, to the best of their ability, to labour for the interests of the shareholders, and if any incentive could be furnished for the continuance of such exertions it would be in this substantial recognition of their past services.

Mr. FORD moved—"That the salary of the secretary be increased from £500 to £700 per annum." He said he was glad the proposal to make this addition to the remuneration of the secretary did not emanate directly from the shareholders. The directors were far better qualified than others to judge of the merits of this officer, and he was sure they would not have suggested the motion which he now submitted if they had not felt that the services rendered by Mr. Dove fully entitled him to such a reward.

Mr. MILEY seconded the motion, and said that, having been an auditor of the company for nearly 20 years, he had been in constant communication with Mr. Dove, and could testify to that gentleman's accurate knowledge of the affairs of the company, and to the uniform courtesy with which he discharged the duties of his office.

Mr. PRICE proposed as an amendment that the increase be to £800 per annum.

Mr. RAWLINSON, C.B., seconded the amendment, believing that the principal officer of such a company would not be over remunerated at that rate.

Mr. RITCHIE said he rejoiced very much at the proposition now before the meeting, and he wished to ask the chairman whether, in the present prosperous condition of the company, the directors had considered the propriety of giving a bonus to the subordinate officers, upon whom so much of the satisfactory working of the concern rested.

The GOVERNOR, in reply to the inquiry just made, said the salaries paid to the subordinate officers came before the directors periodically for revision, and additions were made to them from time to time. He thought the shareholders might safely leave that matter in the hands of the board. The remuneration of the secretary was a different thing, as the settlement of the amount to be received by him was left in the hands of the shareholders. At the same time he might state that the directors had fully considered the question, and when the present scale of remuneration to Mr. Dove was determined on they looked forward to the time when an increase should take place. So on this occasion, in suggesting the addition of £200, they looked forward to the probability of again, when the proper time arrived, making a similar recommendation.

Mr. RAWLINSON said he would not press the amendment unless he thought it would be carried unanimously. He had spoken as he had done in order to show Mr. Dove the appreciation in which he was held by the shareholders, and to prove that any addition made to his salary was not made grudgingly.

The amendment was then withdrawn.

The GOVERNOR said Mr. Dove had communicated to him that he felt most grateful for the kind expression of feeling towards him, and was perfectly satisfied with the proposal contained in the original motion.

The resolution was put, and carried unanimously.

The SECRETARY: Gentlemen, it is very gratifying to my feelings to receive this mark of your confidence and approval. The addition which you have so kindly voted to my remuneration has rather come upon me as a surprise. I beg to thank the directors, in the first place, for having brought the subject under the attention of the meeting. I am glad it emanated from them, because they must know much more of me and my services than any of the shareholders can know. I beg, however, to thank the shareholders generally, and to say that I am perfectly satisfied with what they have done.

A vote of thanks was then given to the directors for their services, and the GOVERNOR having acknowledged the same, the proceedings terminated.

SURREY CONSUMERS GAS COMPANY.

The Half-Yearly General Meeting of Shareholders was held at the Bridge House Hotel, Southwark, on Thursday, Oct. 13.—T. POCOCK, Esq., in the chair.

The SECRETARY (Mr. Boddy) read the advertisement convening the present meeting, the minutes of the last meeting, and the following report of the directors:—

The statement of accounts for the six months ending the 30th of June last is herewith submitted for the consideration of the shareholders.

The available balance of profit is £13,366 1s. 8d., out of which the directors recommend the payment of the usual dividend of 5 per cent. for the half year, which will leave £2866 1s. 8d. to be carried to next account.

The directors have the satisfaction of observing that whilst the amount of profits enables them to recommend the dividend sanctioned by Parliament, it is also sufficient to uphold the company's plant and machinery in working order.

Dr. **No. 1.—*Revenue Account, for the Half Year ended June 30, 1870.*** *Cr.*

To Manufacture of gas—				By Sale of gas—		
Coals, including dues, carriage, unloading, and all expenses of depositing same on works		£15,600 14 5		Common gas, at 4s. per 1000 cubic feet	£25,874 3 11	
Purifying materials, oil, water, and sundries (works		283 7 10		Public lighting and contracts	6,429 13 8	
Salaries of engineer and officers at works		520 0 0				£32,303 17 7
Wages at works		2,753 18 9		Residual products—		
Repair and maintenance of works and plant (including renewal of retorts), machines, apparatus, tools, materials, and labour		1,249 11 5		Coke, less labour and cartage	6,037 10 5	
		20,407 12 5		Breeze	69 2 10	
Less old materials sold		48 12 6		Tar	961 16 5	
			£20,358 19 11	Liquor	388 16 8	
Distribution of gas—						7,457 6 4
Salaries of inspector and clerks in Light Office		280 0 0		Rents		107 16 5
Repair, maintenance, and renewal of mains and of service-pipes, including materials, laying and paving, and labour		1,227 19 3		Transfer fees		3 2 6
Repairing, renewing, and refixing meters		667 2 6				
			2,175 1 9			
Public lamps—						
Lighting and repairing			626 12 10			
Rents, rates, and taxes—						
Rents		79 12 0				
Rates and taxes		1,335 18 7				
			1,415 10 7			
Management—						
Directors allowances		675 0 0				
Salaries of secretary, accountant, office-keepers, and messengers		495 12 6				
Collectors commission and salaries		374 4 10				
Stationery and printing		139 11 0				
General establishment charges		247 8 10				
Auditors		31 10 0				
			1,963 7 2			
Law charges			7 9 4			
Bad debts		330 1 0				
Discounts		112 9 3				
			442 10 3			
Total expenditure			26,989 11 10			
Balance carried to profit and loss account			12,887 11 0			
			£39,877 2 10	Total receipts		£39,877 2 10

Dr. **No. 2.—*Capital Account, for the Half Year ended June 30, 1870.*** *Cr.*

	Expenditure to Dec. 31, 1869.	Expended this Half Year.	Total to June 30, 1870.		Certified Receipts, Dec. 31, 1869.	Received during Half Year.	Total Receipts to June 30, 1870.
To Expenditure, to Dec. 31, 1869	£266,166 19 10			By Ordinary shares of £10 each	£150,000 0 0	..	—
				Ditto shares of £10 each, £6 paid up	60,000 0 0	..	—
				Mortgages and bonds	56,060 0 0	..	—
							£266,060 0 0
Total expenditure			£266,166 19 10	Balance	..	..	106 19 10
			£266,166 19 10				£266,166 19 10

Dr. **No. 3.—*Profit and Loss Account, for the Half Year ended June 30, 1870.*** *Cr.*

To Interest on mortgages and bonds, to June 30, 1870	£1,391 18 10	By Balance of net profit brought from last account	£12,370 9 6
Balance of net profit to be carried to next account, subject to half year's dividends to June 30	13,366 1 8	Less dividend paid for the half year ended Dec. 31, 1869	10,500 0 0
			£1,870 9 6
		Balance brought from Revenue Account (No. 1), being profit for half year to June 30, 1870	12,887 11 0
	£14,758 0 6		£14,758 0 6

Dr. **No. 4.—*General Balance-Sheet, June 30, 1870.*** *Cr.*

To Profit and loss account—		By Cash at bankers	£8,202 9 7
Balance at credit thereof (Account No. 3)	£13,366 1 8	Coals, for stock on hand, June 30	1,170 3 0
Unpaid dividends	110 5 6	Gas-rental—	
Sundry tradesmen and others, for amount due for coals, stores, &c., to June 30	9,701 4 8	Balance of this account due to the company on June 30, less deposits and prepayments	12,340 6 7
		Coke and other residuals	1,124 13 3
		Sundry accounts	232 10 7
		Balance, capital account	106 19 10
	£23,177 11 10		£23,177 11 10

We have compared the above with the books and vouchers produced, and confirm the correctness thereof.

N. J. POWELL, W. WESTCOTT, *Auditors.*

Oct. 5, 1870.

The CHAIRMAN, in moving the adoption of the report, said the directors met the shareholders on this occasion with very great satisfaction. It would be seen that the business was prosperous, and that the company's works were in good order and condition. The directors were not able to present accounts of such a flourishing character as in some other companies, indicating a rapidly increasing rental, and a handsome reserve-fund. One reason for this was that the district of this company was peculiar—it was very straggling in parts, and though their excellent engineer brought to bear all his talent and energy in their service, he could not produce profit where the district was barren and unproductive. Still the company was progressing, and, as compared with its state in some former years, it furnished good ground for satisfaction and hope. The directors were gratified that they could see their way, not only to keep the works in good order, but to pay the full dividend allowed by Parliament, and still have a good balance over. Although the gas agitation had ceased, the companies were not altogether free from trouble. Under the new assessment Act a large increase had been made in the assessment of their works. In the case of this company the assessment had been raised from £3500 to £11,200. The directors desired only that which was just and equitable, and they appealed to the Assessment Committee, and endeavoured to prove that the rateable value of the company's property should not be increased beyond £4500. The Assessment Committee reduced it to £9000, and the directors feeling that this was an excessive amount, had resolved to appeal to quarter sessions, and endeavour to get justice done in the matter. In accordance with an intimation given at the last meeting of shareholders, the directors had taken into consideration the question of the remuneration to the auditors. At present they received sixty guineas annually for their services, and the directors thought that remuneration should be increased to forty guineas each. With these observations, he moved the adoption of the report.

Mr. DUVALL seconded the motion.

Mr. LIDDLE said he would give notice that at the next meeting he should move to increase the remuneration of the auditors to forty guineas each.

Dr. EVANS made some observations on a comparative analysis of the accounts.

Mr. FINLAY replied to the observations of the honourable proprietor, and pointed out that he had not compared the accounts of corresponding half years, or he would have found the amounts very nearly corresponded.

A SHAREHOLDER asked what was intended to be done with the balance of net profit after payment of the dividend. He thought it ought to be invested so as to form the nucleus of a reserve-fund.

Mr. NICHOLSON said the directors would have to exercise great care about putting aside this balance. They must keep a sum of money in hand to meet contingencies.

Mr. BLAKE said the balance would only be about £2800, and it would be unwise to lock it up in securities paying 2 or 3 per cent., when the company had bonds bearing a higher rate of interest occasionally coming due.

The motion was then put, and carried unanimously.

On the motion of the CHAIRMAN it was resolved—"That a dividend at the rate of 10 per cent. per annum, free of income-tax, for the half year ending June 30, be now declared and made payable on and after Monday, the 24th inst."

Mr. DUVALL said he had now a very pleasing duty to perform; and, after hearing the report of the satisfactory progress and condition of the company, he thought the shareholders would gladly adopt the resolution he was about to move. They must all feel convinced that if the company had not good officers' the shareholders would not receive so good a dividend. Fortunately, in their engineer and secretary the company had most excellent officers, and he had very great pleasure in moving a vote of thanks to them for the able and efficient manner in which they had discharged their respective duties during the past half year.

Mr. LAUGHTON seconded the motion.

The CHAIRMAN, in putting the motion, spoke in highly complimentary terms of the engineer and secretary, and expressed his entire concurrence in the vote.

The motion was cordially adopted.

Mr. FINLAY, the company's engineer, said he felt greatly obliged for the compliment paid to him, which possessed the additional value of having been proposed by the directors, who were in the best possible position for appreciating his services.

Mr. BODDY, the secretary, also appropriately acknowledged the vote.

Mr. LIDDLE moved that the thanks of the meeting be given to the directors for their services.

Dr. EVANS seconded the motion, which was carried unanimously.

The CHAIRMAN acknowledged the vote, and the proceedings terminated.

CHARD, SOMERSET.—The new gas-works erected in this town by Messrs. Willey and Ford, gas engineers, of Exeter, from plans and designs prepared by them, were successfully opened a few days since. The town-hall was brilliantly illuminated on the occasion.

ON THE AMOUNT OF LIGHT TRANSMITTED BY PLATES OF POLISHED CROWN GLASS AT A PERPENDICULAR INCIDENCE.

By OGDEN N. ROOD, Professor of Physics in Columbia College.

[From the *American Journal of Science and Arts.*]

(*Continued from page* 412.)

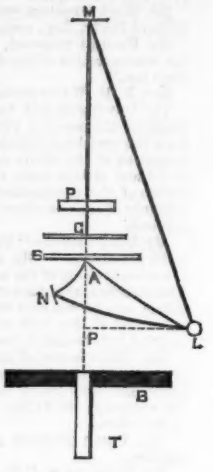
PART II.

PHOTOMETRIC EXPERIMENTS.

It would seem that in the direct photometric experiments on this matter the instrumental means employed have been more or less defective, in consequence of which the results gained, although having a certain amount of general correctness, still leave much to be desired. The main sources of error have been, first, the use of a defective mode of making the compensations, not allowing the experimenter to take full advantage of the sensitiveness of the eye; and secondly, the employment of *two sources* of light, which always brings with it another set of unavoidable errors. Apart from this, in cases when the amount of reflected or transmitted light has been thus approximately obtained, the indices of refraction of the substances used do not seem to have been determined, so that for *perpendicular incidence* slender data exist for comparing the results of theory and experiment.

It will be seen in what follows that, to avoid the variability caused by two sources of light, I have devised a method in which only a single gas-flame is employed, the light being divided in such a way that a certain portion of it always illuminates the posterior side of the screen, while the other portion is reflected from a moveable mirror, and pursues its way unobstructed to the screen, or is transmitted to it by the plate under experiment. The compensation is made by moving the mirror, and, when once effected, of course remains undisturbed by fluctuations of the flame. In addition to this, it will also be observed that a more delicate screen, constructed, however, on the general principles indicated in the first part of this paper, has been employed, and these modifications, taken in connexion with certain precautions described below, have given the results an accuracy superior to that attained in the experiments on silver mirrors.

Arrangement of the Photometer with a Single Gas-flame for Experiments on the Amount of Light transmitted by Plates of various Substances.



The source of light is a small gas-flame at L, about an inch in height, the gas flowing as before from a plain circular opening. A portion of its light, L A, directly illuminates the screen, S, while another portion, N A, is reflected on the screen by a Liebig's mirror, one protected by a coating of copper being selected; this equalizes the light on both sides of the bare "spot" in S. A third portion of the light from L falls on M, a mirror like that just mentioned, and there is reflected perpendicularly through P, the plate under examination, on G, the ground glass. It will be observed that the path pursued by the light in this latter case is the distance L M + M G; by the graduation on the instrument M G is actually measured, G P is known; also P L; hence we have the means of calculating the distance M L, which is to be added to M G, giving the distance required. As these calculations involve some labour, I constructed for my instrument a table by which the *measured* distance, G M, is readily converted into the *total* distance.

The photometer was the same as that described in the first part of this paper, the following changes having been introduced:—The "spot" on the screen was made much smaller, being only about $\frac{1}{30}$ of an inch in horizontal diameter, with a length about three times as great; it was observed by a small telescope T, magnifying six diameters. This reduction in the size of the "spot" rendered it possible to illuminate the ground surrounding it in a manner beyond reproach.

Mode of Adjusting the Apparatus for Experiment.

1. The centre of the flame at L, and the centre of the mirror M, must be at the same height above the common base.

2. The screen and plates to be examined are to be made perpendicular to the axis of the instrument, by the aid of the small gas-flame mentioned in the first part of this paper; the telescope T is also most readily collimated by the use of the same flame, the screen, &c., having been temporarily removed.

3. The mirror M evidently must be brought into such a position that it shall send the ray M P perpendicularly to P, or along the axis of the instrument when its distance is such as to effect compensation; for if the reflected ray were sent obliquely through the ground-glass plate G, noticeable errors would be introduced. This adjustment, which is important if good results are expected, is best effected by making one or two compensations so as to determine approximately the correct distance of the mirror, which is then rotated on its vertical axis so that the reflected image of the flame is made to fall in the centre of the field of the telescope, the screen having been previously removed. By a repetition of this operation finally the mirror is brought into its proper position, when a *single* series of measurements can be made, the minute differences in the individual compensations introducing no appreciable errors. When, however, the compensation point itself has been shifted by the introduction or removal of a plate of glass, the mirror will correspondingly be moved away or towards S, and of course the ray M P will be sent a little to the right or left, and it becomes necessary to devise some simple way in which this difficulty can be obviated, without in each instance removing the screen and altering the focus of the telescope.

The mirror then being actually in adjustment, this, when lost, can be recovered as follows:—In the screen B, about 4 inches above the telescope, is a circular aperture $\frac{1}{10}$ of an inch in width. The reflection of the flame in the mirror is observed through it with the naked eye, and the image of the flame is seen higher up on the mirror, and is made to coincide with a short black line drawn there previously. The ray M P can always thus be made to coincide with the axis of the instrument, it not even being necessary for the observer to leave his seat or diminish the sensitiveness of the eye by exposure. I am particular in describing this precaution, having in my own case rejected the results of 1300 compensations which were made with a comparative lack of attention to this single point.

Mode of Measuring the Amount of Light transmitted by a Plate of Glass, &c.

1. The plate is placed at P, and collimated by the use of the small gas-flame.

2. A compensation is effected by moving the mirror.

3. The mirror is adjusted by the use of the aperture in B, and another compensation made, followed by a second adjustment of the mirror, if necessary.

4. A series of careful compensations are now made, *alternately by the approach and recession of the mirror;* these are registered on the fillet of paper.

5. The plate is removed without the experimenter changing position or exposing the eye to bright light, and a compensation is made which necessitates, of course, a new adjustment of the mirror by the aid of the aperture in the screen B. Finally, a series of compensations are effected with the free flame, and registered.

At this point it may be well to notice an objection which might be urged to this mode of experimenting—viz., it is evident that the angles at which the light is reflected from the mirror will not be identical in the presence and absence of the plate of glass, and as the amount of light reflected by glass and silver varies with the angle of reflection, this might become a source of error, and necessitate a correction. With the plates of colourless glass employed by me, however, the angle in one case was 5° 30′, and in the other 5° 18′, the difference of 12′ being much too small to produce an appreciable effect, as we know from the results of older experiments.

For the purpose of showing what can be effected by this method, I can, perhaps, do no better than give the results of five sets of experiments. Each of them consisted of four sets of eight double or sixteen single compensations, and during the progress of each trial the conditions remained the same. The experiments were made as follows:—Eight double compensations were effected with the photometer and registered; then everything being arranged as before, a new set of compensations were made, &c., all of which was repeated four times. The arithmetical mean of the distances of the source of light from the screen was then obtained separately for each of the four experiments, and from these four mean values of the distance a final mean value was deduced. This last quantity was then squared and compared separately with the squares of each of the first four mean distances, which proceeding tells at once the difference of the four results from the final mean result, in per cents. or fractions of a per cent., and is adapted to give an idea of the degree of accuracy to be expected in this kind of observation.

Differences from mean in per cents.:

No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
+·012	−·275	−·252	+·573	−·102
+·347	+·126	−·137	−·208	+·057
+·158	−·124	+·385	−·060	+·041
−·512	+·275	+·007	−·308	+·005

It will be observed that in the 20 experiments, only two cases occur in which the difference rises slightly above one-half per cent., or above $\frac{1}{200}$ of the whole

quantity of light, while in nearly all the other cases the difference falls considerably below this quantity, and the average of their differences is less than 0·2 per cent., or less than $\frac{2}{100}$ of the whole amount.

As the reliability of measurements with a photometer is evidently connected with the power of the eye in distinguishing different degrees of brightness in adjacent surfaces, it is well to review here briefly the results that have been obtained by different observers, as to the sensitiveness of the eye under favourable conditions.

The least difference which Boguer with his method (two shadows) was able to distinguish was $\frac{1}{81}$ of the whole; Fechner's friends using the same method were able to reduce this quantity to $\frac{1}{100}$. Arago remarked that where one of the illuminated surfaces was in motion smaller differences could be perceived, and was able under favourable circumstance to distinguish $\frac{1}{131}$; while Masson, who used revolving discs, along with his friends, was able to distinguish between $\frac{1}{50}$ to $\frac{1}{100}$ of the whole quantity of light. Near a window Helmholtz was able to distinguish with certainty a difference of $\frac{1}{133}$, and occasionally as small a quantity as $\frac{1}{167}$, while in the middle of a room he was able to appreciate certainly only $\frac{1}{117}$, seldom and uncertainly $\frac{1}{132}$.*

In all the better of the above-mentioned experiments, photometers in any proper sense of the term were not employed, the best of them being made by the use of revolving discs of white paper furnished with narrow black sectors, which are calculated to discover the absolute sensitiveness of the eye under the most favourable conditions. It must not, however, be imagined that because a good eye can distinguish a difference of $\frac{1}{100}$ on a revolving disc, that the same eye would be able to obtain a similar result with ordinary forms of the photometer, where the conditions are far less favourable, and accordingly it seemed of interest to me to determine by a series of experiments the average sensitiveness of the eye while using the photometric method described in this paper, particularly as the plan of using a single flame and mirror offered great facilities for making these observations in a reliable manner. The following mode was employed:—The light from the mirror was allowed to fall on the unobstructed screen, and the mirror was *drawn up* till the spot had disappeared, when the observation was registered; the next compensation was made by *pushing* the mirror *away*, and so on alternately, *the compensations by pull and push being registered on separate billets of paper by two pens.* In the first experiment 14 compensations were made by the advancing, and an equal number by the retreating mirror, and the mean of these 28 quantities was taken as the true distance of the mirror from the screen; then on comparing the mean of either set of compensations with this true distance, it was easy to ascertain how great a difference from the truth had been tolerated by the eye under the given circumstances. In the first experiment this quantity was found to be $\frac{1}{114}$, in a second similar trial $\frac{1}{125}$ of the total amount of light. The "screen" in these experiments was quite *new*, and an inferior result was obtained by using a "screen" which had for six weeks been exposed quite unprotected to the action of the air. Here the usual darkening of the edges had begun and progressed so far as to be faintly visible during compensation.

In the experiments just detailed the highest *average* sensitiveness of the eye is only $\frac{1}{133}$, while as before shown in practical use the average difference from the mean is less than $\frac{2}{500}$ of the whole. This higher degree of accuracy results naturally from the mode in which the compensations are made (alternately by approach and recession), and the fact that the compensations are thus interwoven, in such a manner as to eliminate errors introduced by the slightly varying sensibility of the eye.

Experiments on the Amount of Light transmitted by Plates of Glass at a Perpendicular Incidence.

A knowledge of the amount of light transmitted and reflected by colourless transparent substances has a certain degree of interest from a technical point of view, enabling opticians to calculate the loss necessarily experienced in various instruments from this source, as well as the intensity where the light is reflected from a single or from two parallel surfaces of glass or other material. Of far more importance, however, is the interest attaching to this subject from a theoretical point of view, and especially in connexion with the Undulatory Theory of Light. Formulas for the intensity of the reflected and transmitted beams at all angles have been deduced by eminent supporters of this theory, which in some cases have occasioned considerable discussion. The following very simple formula for the intensity of common light reflected at a perpendicular incidence was first given by Thomas Young: $I = \frac{(n-1)^2}{(n+1)^2}$; the intensity of the incident beam being equal to unity, and n being the index of refraction of the reflecting substance. The same formula was afterwards reached by Poisson in a rigid and learned analysis of the subject, and it was again deduced by Fresnel.† As is well known, Fresnel's formulas were subsequently modified by the celebrated Cauchy, but in Cauchy's formula for reflection, as soon as the incidence of the light differs considerably from the polarizing angle, the small quantities which depend on e, the coefficient of ellipticity, become so much reduced that they can be omitted from the numerator and denominator, and Cauchy's formula becomes identical with Fresnel's.‡ It hence appears that the formula above quoted is as well theoretically established as any which has been deduced under the guidance of the undulatory theory, and one would naturally suppose that it had been often tested carefully by experiment. This does not seem to have been the case, and I do not know that it has ever been rigidly tried by a delicate photometric method. On this account I have made a series of observations on plates of colourless glass, which are detailed below.

Mode of Experimenting.

When a beam of light falls on a plate of glass or other transparent colourless substance, a certain portion will be reflected, another portion transmitted, and a third absorbed. If the plate of glass be colourless and thin, the portion absorbed will be smaller than the necessary errors of observation, so that it can safely be neglected. For example, Bunsen found that in using a plate of crown glass 4·7 millimètres thick, that it absorbed only $\frac{4}{10}$ of 1 per cent. of the *chemical* rays that fell on it at a perpendicular incidence.§ The thickest plate of glass employed by me was 1·67 millimètres from surface to surface—i.e., about one-third of that used by Bunsen, and as we know that the chemical rays are extinguished by glass in a far larger proportion than those which are luminous, it follows that in the plates mentioned below we can safely neglect the internal extinction. This point being settled, the mode of proceeding becomes quite simple; it is only necessary to measure the amount of light transmitted, and the difference between the incident and transmitted light gives the amount of that reflected, and after making a correction for internal reflection, we shall have the means of comparing the results of theory and experiment.

Mode of Determining the Indices of Refraction.

In my experiments on transparent substances, always where it was possible, prisms of the substance were ground, and the index of refraction of the sodium line determined as usual with a graduated circle, collimating and observing telescope. In the particular experiments detailed at the termination of this article, the plates of glass used were so thin that it was not practicable to grind from them prisms, and for all such cases I contrived, tested, and used two somewhat new modes of procedure, as neither the method of the Duke de Chaulnes (alteration of the focus of a microscope) nor that of Bernard (displacement of an image viewed obliquely through a plate) was here found to give reliable results.

1. A minute angular fragment of the glass to be experimented on was placed in a cell, on a glass slide, like those used for mounting microscopic objects, and surrounded with a mixture of "body sperm oil" and oil of cassia, the proportions being varied till the refraction of the glass for the sodium line had been exactly compensated by the oil. *Olive oil* became turbid when mixed with the oil of cassia, and hence could not be used. The mode of comparing the refractive power of the mixture of the oils and glass was as follows:—At the distance of half an inch below the level of a microscopic stage was a fine slit, cut in tinfoil which had been pasted on glass; the microscope was focussed on this, a sodium flame being used to illuminate it; the cell with the oil and fragment of glass was then placed on the stage of the microscope, and moved so that the light from the slit passed through the angular fragment, when it would happen that the line of light would be refracted to the right or left hand according as oil or glass predominated in refractive power, which made it instantly evident whether sperm oil or oil of cassia was needed. A number of experiments were made to test this method, which was found to answer well, the index of refraction as determined by prism corresponding with that obtained by the use of the fragment; so in the case of a sample of crown glass, a triangular prism gave the index of refraction as 1·526, while by the new method it was found to be 1·529. This method, however, is capable of still more accurate results, as in the above-mentioned experiments the compensation was pushed far enough to answer my immediate purpose; that is to say, the fragment may be considered to consist of one *large* triangular prism with a moderate angle, and a number of smaller prisms, some of which are sure to have very large angles; these latter become effective when the glass is under oil, total reflection no longer taking place, and they act powerfully on the light coming from the slit, still furnishing faint images having a considerable deviation even after the main portion of the glass fragment has ceased to perceptibly deflect it.

In no case did I push the compensation far enough to gather in all these outstanding beams.

2. Another method, which in the case of crown glass was found to answer quite well enough for my purpose and to be very convenient, consisted in fusing to a spherical globule a fragment of the glass, placing it in the mixed oils and effecting compensation by observing when the globule ceased to act as a lens, for which purpose a small telescope or the microscope can be employed. Thus, for example, a certain kind of ground glass when ground into a prism gave as index of refraction for the sodium line 1·526, while when tested according to this second method, the results of two experiments were 1·5232 and 1·5235.

I give now the results of careful sets of experiments on the amount of light transmitted by two different samples of crown glass; in each case the results of four independent trials are given, each trial being worked out with the aid of seven double compensations. In the first case the thickness of the glass was ·15 millimètres, the index of refraction 1·5236, and allowing for the effects of internal reflection, it should, according to theory, have transmitted 91·736 per cent. of the light falling on it. Experiment gave:

92·227
91·371
91·019
91·143
91·440

The difference ·296 being hardly larger than the necessary error connected with the method of making the determination.

In the second case the index of refraction was 1·5225, the thickness 1·677 millimètres, and by theory it should have transmitted 91·763 per cent. of the light falling on it. Below are the actual results obtained:

90·886
90·948
90·892
91·895
91·155

The difference here of ·500 per cent. or $\frac{2}{100}$ of the whole amount, is almost equally satisfactory, and these experiments show, I think, that the reflecting power of glass with the above index of refraction, *conforms in the closest manner to the predictions of theory.* Elaborate experiments were also made with flint glass, quartz, and calc-spar, but I suppress the results, as it afterwards turned out that they were contaminated with minute errors of the character described in this article under the head "Mode of Adjusting," &c., 3rd; the adjustment alluded to having indeed been always made, but not with a sufficient degree of care to exclude the last trace of error.

* Physiologische Optik, von H. Helmholtz, p. 311.
† Pogg. Annalen, Bd. xxii., p. 98. ‡ Jamin in Pogg. Erg., Bd. iii., p. 256.
§ Pogg. Annalen, Bd. ci., p. 241.

MANCHESTER GAS SUPPLY.

The Gas Committee of the Manchester Corporation have presented the following report to the council:—

Your committee submit herewith an abstract of the accounts of this department for the year ending June 24 last, and also the usual tabular statements.

Appendix A shows the amount of lamp and private rental derived from the townships within and beyond the city respectively, for the past two years.

Appendix B, the quantity of gas transmitted from the works in the daytime, and during the whole 24 hours of the day, in each month, for the years 1868-69 and 1869-70.

Appendix C, the number of meters in use on the 24th of June, 1869 and 1870.

Appendix D, the main-pipes laid to the 24th of June, 1869, and those laid and taken up during the year ending the 24th of June, 1870.

Appendix E, the amount of the gross profit, and the mode of its appropriation; the amount of borrowed money owing, and the excess of assets in each year from 1860 to the 24th of June last.

Revenue.

The rental for the past year (including meter-rents) has amounted to the sum of £212,645 12s. 3d., being an increase of £17,820 7s. 6d. upon that of the previous year. With the addition of the rental from the Droylsden district, the total amount is £216,164 10s. 1d., and the increase £21,339 5s. 4d.

The gross amount of profit, including Droylsden, is £65,343 10s. 8d., as against £52,736 18s. 4d. in the previous year, and is appropriated as follows:—Payment of interest, £16,784 13s. 8d.; transferred to capital account towards liquidation of the mortgage debt, £24,487 6s.; and the surplus to be paid over for improvement purposes, £24,071 11s., as against £14,580 11s. 6d. the previous year.

In addition to £24,071 11s., the amount of the surplus profit, the further sum of £3750, in anticipation of future profits, will be paid over for improvement purposes, in accordance with the arrangement sanctioned by the council on the 4th day of March, 1868, making together the sum of £27,821 11s. 6d.

The number of consumers has increased (exclusive of Droylsden) 4·21 per cent., amounting now to 55,692, as against 53,444 the previous year; and, with the addition of Droylsden, to 56,642.

The quantity of gas consumed, also exclusive of Droylsden, has exceeded that of the previous year by 115,171,000, or 8·61 per cent. With the addition of Droylsden, the consumption has amounted to 1,466,211,000 cubic feet, and the increase to 130,736,000.

Your committee also submit the reports of Mr. John Leigh, the consulting and analytical chemist to this department, and Messrs. S. E. Cottam and Son, the accountants appointed by the council to audit the accounts for the past year:—

"*To the Chairman of the Manchester Gas Committee.*

"Sir,—I have the honour to report to you that the average illuminating power of the Manchester gas during the past year has been equal to 20·36 sperm candles, burning at the rate of 120 grains per hour, the consumption of the gas having been reduced to a constant standard of 5 cubic feet per hour. The photometric observations have been made almost daily at the Gaythorn gas station and at the Rochdale Road station.

"The gas has been tested daily for sulphuretted hydrogen and for ammonia. It has been almost absolutely free from sulphuretted hydrogen, and has contained very little ammonia. It has been very free from naphthaline and from tarry matter.

"I have, &c., "JOHN LEIGH, M.R.C.S.

"*Town-Hall, Manchester, Aug.* 30, 1870."

"2, *Essex Street, King Street, Manchester, Sept.* 1, 1870.

"Gentlemen,—We are glad to be able to report (rather earlier than usual) that our examination of the gas accounts for the last year (ending the 24th of June last) is completed, and we have pleasure in stating that we find everything correct. We stated last year the details of the audit as pursued by us; the same plan has been followed this year, and, in addition, we have carefully gone over the Droylsden accounts, which have now been incorporated with your own. We have only now to say there is nothing that appears to us to require special report as far as book-keeping and accounts are concerned.

"Thanking you for the favours of the last two years, we are, &c.,

"SAMUEL E. COTTAM AND SON.

"The Gas Committee, Manchester Corporation."

In concluding this report, your committee cannot but review with satisfaction the results of the working of this department since the year 1860, and which are more particularly shown in the tabular forms herewith submitted.

Since that year the then existing works have been almost entirely reconstructed, and largely extended; the length of mains has been increased by upwards of 160 miles, the number of consumers from 33,000 to upwards of 56,000, and the quantity of gas supplied has increased from 779 millions to upwards of 1450 million cubic feet per annum.

Notwithstanding this increase in the quantity of gas supplied annually, and the consequent extension of the works and mains, the amount of borrowed money owing, including the amount paid for the land near Bradford Road, has been increased by the sum of £66,766 only, whilst the excess of assets has, by the operation of the sinking-fund, been increased by the sum of £198,581.

It is also satisfactory to remark that, with the largely increased works, the annual charge for interest has been increased by £529 only, and that the gross profit now somewhat exceeds that of 1860, notwithstanding the various important reductions which have been made in the price charged for gas.

On behalf of the Gas Committee,

JOHN KING, jun., Chairman.

Gas Offices, Albert Square, Sept. 30, 1870.

Profit and Loss Account, for the Year ending June 24, 1870.

Dr.				*Cr.*			
To Cannel			£102,355 10 2	By Gas-rental—			
Retort men's wages			18,325 18 1	Within the city—			
Retorts, materials, and setting			6,291 17 2	Private consumers	£158,815 4 3		
Purifying charges			2,488 8 0	Meter-rents	2,464 3 5		
Labourers wages, and repairs, &c., of works—				Public lamps	9,348 2 5		
Gaythorn station	£4,247 18 6					£170,627 10 1	
Rochdale Road station	3,392 12 4			Beyond the city—			
Street-mains	4,497 6 2			Private consumers	£38,562 12 11		
		12,137 17 0		Meter-rents	567 15 2		
Salaries—				Public lamps	2,887 14 1		
Thomas Peacock, in-door superintendent	£600 0 0					42,018 2 2	
John R. Macfarlane, manager, Gaythorn station	600 0 0						£212,645 12 3
Henry Lyon, manager, Rochdale Road station	500 0 0			Coke, tar, and ammonia water			31,220 1 3
John Leigh, consulting chemist	250 0 0			Gas-rentals—Droylsden works			3,518 17 10
Thomas Rafferty, surveyor of street-mains	348 15 0			Coke, tar, &c.—ditto			423 18 0
Jonas Croft, chief clerk	300 0 0						
John Bardsley, chief meter inspector (portion of year)	75 0 0						
William A. Nield, chief meter inspector	230 0 0						
Charles Headen, draughtsman, street-mains	132 0 0						
J. E. Slater, clerk, and collector of mis. accounts	130 0 0						
Thomas C. Lever, inspector of fittings	109 8 4						
Charles Dobbs, ditto	109 8 4						
Theodore Carr, clerk in rental office	100 6 6						
William Ayrton, ditto	90 0 0						
J. Whittingham, ditto	80 0 0						
Richard Davies, ditto (portion of year)	61 8 6						
City surveyor (portion of salary)	100 0 0						
City treasurer (ditto)	100 0 0						
Wages of meter inspectors and assistants in rental and inquiry offices, at 35s. per week and under	4,014 5 10						
		7,930 12 6					
Collectors poundage, &c.—							
John Ashcroft	£287 15 8						
Charles Nickson	265 16 11						
James Whittaker	227 6 11						
Oswald Turner	187 7 4						
William Stubbs	175 4 4						
Thomas E. Harley	178 0 11						
Samuel Robinson	166 10 8						
Jabez Ashworth	166 11 8						
Charles Westoby	167 8 0						
James Warrington	169 0 5						
Richard G. Walker	168 5 8						
William Richardson	146 9 4						
William C. Hodson	146 12 10						
Thomas Gillibrand	136 19 7						
Thomas Hoyle	137 17 2						
Thomas Halbard	139 10 2						
James Bellhouse	138 13 4						
William Horsfall	138 0 4						
John Hall, poundage on broken period rentals	27 11 1						
Arthur Leason, ditto	23 16 7						
Edwin Neesom, ditto	14 0 3						
James Shaw, receiver of rentals paid in the office	280 0 0						
John Ogden, assistant ditto	150 10 0						
Collection of arrears—							
John E. Slater	6 17 7						
		3,646 6 9					
Chief and other rents and rates, &c.—							
Chief rents	£260 4 11						
Rates and rents of offices	713 8 8						
Rates on stations and street-mains	4,020 5 4						
		4,993 18 11					
Income-tax		1,059 8 4					
Amount transferred to capital for depreciation of works—							
Gaythorn station—							
4 p. ct. on buildings (£79,712 17s. 2d.)	£3 188 10 3						
5 p. ct. on apparatus (£38,149)	1,907 9 0						
	£5,095 19 3						
Rochdale Road station—							
4 p. ct. on buildings (£87,108 9s. 8d.)	£3,484 6 9						
5 p. ct. on apparatus (£39,084 3s. 11d.)	1,954 4 2						
	5,438 10 11						
Street-mains store (Poland Street)—							
4 p. ct. on buildings (£1867 14s. 7d.)	£74 14 2						
5 p. ct. on apparatus (£495 14s. 6d.)	24 15 9						
	99 9 11						
Street-mains—							
2½ per cent. on main-pipes (£207,006 5s. 4d.)	5,175 3 1						
Hired meters and fittings—							
10 per cent. on £18,121 13s. 6d.	1,812 3 4						
Meter-proving apparatus—							
10 per cent. on £119 13s. 8d.	11 19 4						
		17,633 5 10					
Stationery and advertising		381 2 6					
Law stationery, receipt, postage, and deed stamps, &c.		341 7 9					
Clothing for inspectors, &c.		381 12 0					
Subscriptions to Infirmary, Eye Hospital, &c.		77 10 9					
Repairs of hired meters		81 9 4					
Miscellaneous expenses		531 7 9					
Commission, &c., charged by bankers		521 10 9					
Bad debts and allowances		943 19 3					
Droylsden works		2,341 15 10					
Balance carried down		65,343 10 8					
		£247,808 9 4				£247,808 9 4	
Interest on loans, &c. (less income-tax)		£16,784 13 8		Balance brought down, being gross profit on the year's working		£65,343 10 8	
Amount transferred to capital account, towards liquidation of mortgage debt		24,487 6 0					
Surplus payable to the improvement department		24,071 11 0					
		£65,343 10 8				£65,343 10 8	

General Summary of Receipts and Expenditure on Capital and Revenue Account, June 24, 1870.

Dr.				*Cr.*			
To Balance in the bank, June 24, 1869		£29,240 4 1		By Loans repaid		£17,733 6 8	
Ditto in the treasurer's hands, June 24, 1869		59 6 10		Improvement and Chorlton-upon-Medlock Committees—			
Ditto of sums owing to and by the committee, including stocks on hand, June 24, 1869		48,719 2 4		Surplus for the year ending June 24, 1869	£14,580 11 6		
			£78,018 13 3	Advanced in anticipation of future profits	11,303 19 8		
Balance of profit and loss account, as per statement			24,071 11 0			25,884 11 2	
Loans received			55,205 0 0	Expenditure on capital account, viz.—			
Materials, &c., sold (capital account) as per statement—				Gaythorn station	£11,070 13 6		
Gaythorn station	£403 12 7			Rochdale Road ditto	28,772 10 10		
Rochdale Road station	582 10 10			Droylsden works	19,336 0 2		
Meter-proving apparatus	10 0 0			Land, Bradford Road	30,286 9 0		
		996 3 5		Street-mains	9,004 6 8		
Amount transferred from revenue account—				Service-pipes (one moiety)	1,065 9 4		
For depreciation of works		17,633 5 10		Hired meters	6,664 19 2		
Liquidation of mortgage debt		24,487 6 0				106,200 6 8	
				Balance in the bank, June 24, 1870	£3,761 1 4		
				Ditto in the treasurer's hands, June 24, 1870	383 12 6		
						4,144 13 10	
				Ditto of sums owing to and by the committee, including stocks on hand, June 24, 1870		46,448 19 2	
		£200,411 19 6				£200,411 19 6	

Statement of Assets and Liabilities, June 24, 1870.

PERMANENT ASSETS.				LIABILITIES.			
Lower King Street station—				Mortgage debt—			
Land (now let to the Watch Committee, at an annual rent of £300)			£7,500 0 0	Act of 1844—1st charge	£82,921 0 9		
Gaythorn station—				Ditto—2nd ditto	26,397 18 4		
Land, buildings, and apparatus, as per last report—				Ditto of 1854	43,610 0 0		
Land	£55,435 6 10			Ditto of 1858	110,960 2 4		
Buildings	80,744 8 4			Ditto of 1867	141,302 0 4		
Apparatus	38,417 14 0			Total amount secured by mortgage		£405,191 1 9	
Less—		£174,597 9 2		Sums advanced, not secured by mortgage at this date—			
Materials sold, &c.	£403 12 7			John A. Bouck	£1,500 0 0		
Depreciation	5,095 19 3			Admiral Duff's Charity	1,250 0 0		
		5,499 11 10		Highways Committee	8,000 0 0		
		£169,097 17 4		Indian Relief-Fund Committee	5,000 0 0		
One year's outlay to June 24, 1870—				William Pullein	500 0 0		
Yard-mains	203 15 11			Water-works Committee	10,000 0 0		
New purifying-house	934 8 3			Alexander Christy	1,500 0 0		
New engine and exhauster house	763 1 11					27,750 0 0	
New workshops	169 12 4					£432,941 1 9	
New cannel-stores, retort-house, &c.	95 14 3			Purchase of land, the purchase-money being left in the hands of the corporation at interest		1,750 0 0	
New offices and boundary walls	38 3 9			Sundry accounts owing—			
River Street wall	217 4 11			Revenue account	£15,505 7 4		
New experimental apparatus	2 3 4			Extension ditto	6,113 9 2		
New cannel-testing apparatus	250 0 0					21,618 16 6	
New tar and ammonia water pumps	321 12 11			Deposits in hand		8,170 7 10	
New meter and governor house	207 16 0					£464,480 6 1	
No. 6 tank	4,133 3 10			Surplus for the year ending June 24, 1870, payable to the improvement department		24,071 11 0	
No. 6 gasholder	3,687 4 1			Balance, being excess of assets		286,861 15 10	
Street mains store	6 1 0						
Well boring	40 11 0						
Rochdale Road station—		11,070 13 6					
Land, buildings, and apparatus, as per last report—			180,168 10 10				
Land	£26,796 3 1						
Buildings	90,168 11 6						
Apparatus	39,084 3 11						
Less—		£156,048 18 6					
Materials sold, &c.	£582 10 10						
Depreciation	5,438 10 11						
		6,021 1 9					
		£150,027 16 9					
One year's outlay to June 24, 1870—							
Yard-mains	£355 19 11						
New purifying-house	4,221 13 11						
New engine and exhauster house	43 11 11						
New workshops	149 8 1						
New cannel-store	240 3 3						
New ditto, adjoining Dewhurst St.	551 13 8						
No. 3 retort-house	3,648 14 3						
No. 4 ditto	3,480 0 0						
New offices	1,833 3 0						
New railway weighing machine office	109 2 9						
New meter and governor house	8 10 0						
New cannel-testing apparatus	685 10 9						
New tar and ammonia water pumps	819 9 11						
New lime, &c., shed	2,811 11 7						
New coke-hoist	9 0 0						
New gates, Gould Street entrance	114 12 7						
Ditto, Tebbutt Street ditto	49 15 0						
Newtown tanks	7,584 2 0						
Ditto gasholders	1,398 12 4						
River wall, Newtown	657 15 11						
		28,772 10 10					
Droylsden works—			178,800 7 7				
Land, buildings, and apparatus			19,336 0 2				
Bradford Road—							
Land purchased for new works			30,286 9 0				
Street-mains store (Poland Street)—							
Land, buildings, and apparatus, as per last report—							
Land	£1,406 0 0						
Buildings	1,867 14 7						
Apparatus	495 14 6						
Less—		£3,769 9 1					
Depreciation		99 9 11					
			3,669 19 2				
Street-mains—							
Main-pipes, as per last report	£207,006 5 4						
Less—depreciation	5,175 3 1						
		£201,831 2 3					
One year's outlay to June 24, 1870		9,004 6 8					
			210,835 8 11				
Service-pipes—							
Service-pipes laid, as per last report		£15,932 18 10					
Moiety of year's outlay charged to capital account		1,065 9 4					
			16,998 8 2				
Hired meters, &c.—							
Outlay, as per last report	£18,121 13 6						
Less—depreciation	1,812 3 4						
		£16,309 10 2					
One year's outlay to June 24, 1870		6,664 19 2					
			22,974 9 4				
Meter-proving apparatus—							
Outlay, as per last report		£119 13 8					
Less—depreciation	£11 19 4						
Materials sold	10 0 0						
		21 19 4					
			97 14 4				
Total amount of permanent assets			£670,067 7 6				
FLOATING ASSETS.							
Cannel, retorts, and other materials on hand—							
Revenue account		£32,577 2 2					
Gas-rents, and sundry accounts due to the committee—							
Revenue account		43,300 12 10					
Extension ditto		68 1 11					
Amount paid in advance to the improvement department, in anticipation of future profits		24,363 8 1					
Balance in the bank		3,761 1 4					
Ditto in the treasurer's hands		383 12 6					
Gas-rents, &c., owing, and sundry materials on hand—							
Droylsden account		292 6 7					
			104,746 5 5				
			£775,413 12 11				£775,413 12 11
Excess of assets, June 24, 1870			£286,861 15 10				
Ditto of assets, June 24, 1869			262,374 9 10				
Increase, being the amount charged upon the profit for the past year towards liquidation of the mortgage debt			£24,487 6 0				

[Appendix A.]

Statement of the Lamp and Private Rental (including Meter-Rents) derived from the Townships within and beyond the City respectively, for the Years 1868-9 *and* 1869-70.

	Half Year ending Dec. 25, 1868.		Half Year ending June 24, 1869.		Total for the Year 1868-9.	Half Year ending Dec. 25, 1869.		Half Year ending June 24, 1870.		Total for the Yr. 1869-70.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Within the city—										
Township of Manchester—										
Private rental	44101 7 2		45820 14 7			47823 17 10		50942 12 7		
Public lamps	2646 6 0		2413 3 3			2713 16 5		2470 5 1		
		46747 13 2		48233 17 10			50537 14 3		53412 17 8	
Other townships—										
Private rental	28508 4 9		30039 10 6			30273 15 6		32239 1 9		
Public lamps	2003 9 8		2046 1 8			2065 15 8		2098 5 3		
		30511 14 5		32085 12 2			32339 11 2		34337 7 0	
Total within the city		77259 7 7		80319 10 0	157578 17 7		82877 5 5		87750 4 8	170627 10 1
Beyond the city—										
Private rental	16431 1 2		18090 3 6			19275 0 4		19855 7 9		
Public lamps	1337 11 0		1387 11 6			1417 19 4		1469 14 9		
Total beyond the city		17768 12 2		10477 15 0	37246 7 2		20692 19 8		21325 2 6	42018 2 2
Gross rental		95027 19 9		99797 5 0	194825 4 9		103570 5 1		109075 7 2	212645 12 3
Add Dreylsden										3518 17 10
Total rental										£216164 10 1

Within the city: Gross rental (1868-9) £157,578 17s. 7d.; ditto (1869-70) £170,627 10s. 1d.; increase, £13,048 12s. 6d. Beyond the city: Gross rental (1868-9) £37,246 7s. 2d.; ditto (1869-70) £42,018 2s. 2d.; increase, £4771 15s. Total: Gross rental (1868-9) £194,825 4s. 9d.; ditto (1869-70) £212,645 12s. 3d.; increase, £17,820 7s. 6d.; add Droylsden, £3518 17s. 10d.; total increase, £21,339 5s. 4d.

[Appendix B.]

Comparative Statement of the Quantity of Gas transmitted from the Works, in the Day-time and during the Twenty-four Hours, for the Years 1868-9 *and* 1869-70.

	Day-time.			Twenty-four Hours.		
	1868-69.	1869-70.	Inc. or Dec.	1868-69.	1869-70.	Inc. or Dec.
	Cubic Feet.	Cubic Feet.	Per cent.	Cubic Feet.	Cubic Feet.	Per cent.
July	9,638,000	14,269,000	48·04 Inc.	48,268,000	56,030,000	16·08 Inc.
August	10,605,000	15,408,000	45·29 ,,	61,287,000	69,485,000	13·37 ,,
September	12,408,000	17,594,000	41·79 ,,	83,032,000	96,537,000	16·26 ,,
October	26,098,000	22,011,000	15·66 Dec.	137,435,000	140,413,000	2·16 ,,
November	25,157,000	27,347,000	8·70 Inc.	169,901,000	174,675,000	2·89 ,,
December	31,742,000	37,849,000	19·20 ,,	190,622,000	210,153,000	10·24 ,,
January	29,972,000	36,768,000	22·67 ,,	181,583,000	195,657,000	7·76 ,,
February	21,230,000	24,052,000	13·29 ,,	140,254,000	153,534,000	9·46 ,,
March	20,157,000	23,939,000	18·76 ,,	119,482,000	134,215,000	12·33 ,,
April	15,176,000	17,234,000	13·56 ,,	84,173,000	92,510,000	12·57 ,,
May	13,308,000	15,118,000	13·64 ,,	66,664,000	71,673,000	7·51 ,,
June	12,570,000	12,626,000	·44 ,,	52,774,000	55,764,000	5·66 ,,
Total	228,056,000	264,215,000	15·85 Inc.	1,335,475,000	1,450,646,000	8·61 Inc.
Add Droylsden	..	..	..	..	15,565,000	..
					1,466,211,000	

During the day-time (1868-9) 228,056,000 cubic feet; (1869-70) 264,215,000 cubic feet; increase, 36,159,000 cubic feet. During the twenty-four hours (1868-9) 1,335,475,000 cubic feet; (1869-70) 1,450,646,000 cubic feet; increase, 115,171,000 cubic feet; add Droylsden, 15,565,000 cubic feet; total increase, 130,736,000 cubic feet.

[Appendix C.]

Table showing the Number of each Size of Meter in use on the 24th of June, 1869 *and* 1870 *respectively, including those on Hire.*

Size of Meters.	Townships within the City.														Townships beyond the City.		Total.		Increase.	Decrease.
	Manchester.		Chorlton-upon-Medlock.		Hulme.		Ardwick.		Beswick.		Cheetham.		Total within the City.							
	1869.	1870.	1869.	1870.	1869.	1870.	1869.	1870.	1869.	1870.	1869.	1870.	1869.	1870.	1869.	1870.	1869.	1870.		
1 light	98	87	34	25	41	30	19	16	..	4	5	3	197	165	7	7	204	172	..	32
2 lights	10052	10367	3252	3373	6170	6334	2003	2094	228	227	1485	1509	23190	23904	6272	6686	29462	30590	1128	..
3 ,,	4294	4196	1971	1967	2060	2087	578	616	22	31	972	1008	9897	9905	2243	2426	12140	12331	191	..
5 ,,	2488	2509	1135	1335	551	621	247	261	13	14	575	661	5009	5401	1532	1741	6541	7142	601	..
10 ,,	1334	1378	341	376	150	166	82	88	4	5	154	189	2065	2202	609	680	2674	2882	208	..
20 ,,	725	760	96	101	50	56	27	36	1	1	40	44	939	998	227	250	1166	1248	82	..
30 ,,	306	312	29	29	20	22	14	10	3	3	20	20	392	396	84	83	476	479	3	..
45 ,,	49	46	4	4	3	3	3	2	..	..	..	..	59	55	8	9	67	64	..	3
50 ,,	151	176	13	12	9	12	6	9	2	2	8	10	189	221	42	44	231	265	34	..
60 ,,	82	101	3	2	13	13	2	1	..	..	3	5	103	122	12	15	115	137	23	..
80 ,,	66	74	7	6	5	5	1	2	..	..	..	..	79	87	9	9	88	96	8	..
100 ,,	112	115	9	8	7	7	6	5	1	1	6	5	141	141	24	26	165	167	2	..
150 ,,	37	36	5	6	5	5	2	2	..	..	1	1	50	50	11	9	61	59	..	2
200 ,,	12	15	..	..	3	2	..	..	..	..	3	3	18	20	6	8	24	28	4	..
250 ,,	1	1	..	..	..	..	..	..	1	1	..	1	2	3	..	..	2	3	1	..
300 ,,	15	14	1	1	1	2	..	..	..	..	3	2	20	19	7	9	27	28	1	..
500 ,,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	1	1	..	..
Total	19822	20187	6900	7245	9088	9365	2990	3142	275	289	3275	3461	42350	43689	11094	12003	53444	55692	2286	37

Add Droylsden, 950; total meters, 56,642. Deduct decrease, 37; net increase, 2249 meters = 4·21 per cent. Add Droylsden, 950; total increase, 3199 meters.

Statement showing the Number and Sizes of Meters on Hire on June 24, 1870 *(included in the above Table).*

	1 Light.	2 Lights.	3 Lights.	5 Lights.	10 Lights.	20 Lights.	30 Lights.	50 Lights.	60 Lights.	80 Lights.	100 Lights.	150 Lights.	Total, 1870.	Total, 1869.	Increase.
Within the city	164	8610	2441	1032	210	42	15	5	5	3	4	1	12532	10173	2359
Beyond the city	7	1843	637	362	48	4	..	..	2	..	..	..	2903	2374	529
Total	171	10453	3078	1394	258	46	15	5	7	3	4	1	15435	12547	2888

[Appendix D.]

Pipes Laid and Taken up during the Year ending June 24, 1870.

Laid.	Diam. 2 in.	Diam. 3 in.	Diam. 4 in.	Diam. 5 in.	Diam. 6 in.	Diam. 8 in.	Diam. 9 in.	Diam. 10 in.	Diam. 12 in.	Diam. 14 in.	Diam. 15 in.	Diam. 16 in.	Diam. 18 in.	Total Length.
	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.
Within the city—														
Manchester	9368	2563	477	..	196	499	..	..	1089	..	..	274	18	14464
Chorlton-upon-Medlock	2528	991	325	..	..	..	..	..	881	8	..	..	..	4731
Hulme	4769	551	658	..	380	429	..	..	10	..	..	230	..	7027
Cheetham	1558	458	240	..	147	..	..	..	14	..	..	465	..	2882
Ardwick (including Beswick)	2006	600	172	..	264	..	..	..	484	14	..	..	..	3540
	20229	5163	1870	..	987	928	..	..	2458	22	..	969	18	32644
Beyond the city	9444	3892	3517	..	1528	1595	8	117	..	..	..	..	..	20101
Total	29673	9055	5387	..	2515	2523	8	117	2458	22	..	969	18	52745
Taken up.														
Within the city	2322	2297	591	520	310	220	78	..	164	..	655	..	..	7157
Beyond the city	1697	400	937	143	..	..	..	..	..	..	..	..	..	3177
Total	4019	2697	1528	663	310	220	78	..	164	..	655	..	..	10334

Net increase during the year, 42,411 yards.

[Appendix D—*continued.*]

Summary.

	Diam. 2 in.	Diam. 3 in.	Diam. 4 in.	Diam. 5 in.	Diam. 6 in.	Diam. 7 in.	Diam. 8 in.	Diam. 9 in.	Diam. 10 in.	Diam. 11 in.	Diam. 12 in.	Diam. 13 in.	Diam. 14 in.	Diam. 15 in.	Diam. 16 in.	Diam. 18 in.	Diam. 20 in.	Diam. 22 in.	Diam. 24 in.	Diam. 30 in.	Total Length
Pipes laid to June 24, 1869—	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.	Yds.
Within the city	174151	113869	43800	15543	27178	756	13713	13603	1241	353	26414	309	7191	5672	2750	4562	388	477	6433	2513	460916
Beyond the city	78347	42940	38886	6317	20729	410	20956	10745	604	1808	17447	..	737	37	..	682	..	..	315	..	240960
Pipes laid during the year ending June 24, 1870—	252498	156809	82686	21860	47907	1166	34669	24348	1845	2161	43861	309	7928	5709	2750	5244	388	477	6748	2513	701876
Within the city	20229	5163	1870	..	987	..	928	..	..	..	2458	..	22	..	969	18	..	..	..	..	32644
Beyond the city	9444	3892	3517	..	1528	..	1595	8	117	..	..	..	..	..	..	..	..	..	..	..	20101
	282171	165864	88073	21860	50422	1166	37192	24356	1962	2161	46319	309	7950	5709	3719	5262	388	477	6748	2513	754621
Deduct taken up	4019	2697	1528	663	310	..	220	78	..	..	164	..	..	655	..	..	..	..	..	..	10334
	278152	163167	86545	21197	50112	1166	36972	24278	1962	2161	46155	309	7950	5054	3719	5262	388	477	6748	2513	744287
Add, purchased from the Droysden Gas Company	5487	2422	4155	418	1327	..	351	..	606	..	..	..	..	..	..	..	..	..	..	..	14766
Total	283639	165589	90700	21615	51439	1166	37323	24278	2568	2161	46155	309	7950	5054	3719	5262	388	477	6748	2513	759053*

* Total, 759,053 yards, or 431¼ miles and 53 yards.

[Appendix E.]

Statement showing the Amount of Gross Profit, and the Mode of its Appropriation; also the Amount of Borrowed Money Owing, and the Excess of Assets, &c., from the Year 1860 to the present Date.

Year ending June 24.	Gross Profit.	Maximum Price of Gas, per 1000 Feet, within the City.	Appropriation of Gross Profit.			Appropriation of Surplus.		Borrowed Money Owing.	Amount charged to Revenue in respect of Depreciation of Works and Mains.	Excess of Assets.
			Interest.	Liquidation of Mortgage Debt.	Surplus.	Improvement Purposes.	Water-Works Committee.			
	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1860	64779 14 10	Half year 5 0 " 4 6	16255 12 4	13306 5 6	35217 17 0	17608 18 6	17608 18 6	366175 8 4	5000 0 0	88280 7 2
1861	51725 0 1	Half year 4 6 " 4 0	16098 5 3	18980 3 0	16746 11 10	8373 5 11	8373 5 11	379603 0 8	11372 5 0	107260 10 2
1862	42667 7 1	4 0	15482 3 2	19330 14 4	7854 9 7	7854 9 7	....	382539 7 10	12179 4 11	126591 4 6
1863	55804 12 9	Half year 4 0 " 3 9	14932 17 8	18609 17 4	22261 17 9	22261 17 9	....	362877 8 10	12686 18 11	145201 1 10
1864	59545 18 9	Half year 3 9 " 3 6	13388 12 10	17810 1 0	27847 4 11	27847 4 11	....	335808 16 9	12690 12 9	163011 2 10
1865	56432 4 5	Half year 3 6 " 3 2	13086 10 9	17587 0 11	25758 12 9	25758 12 9	....	306031 2 2	13050 6 6	180398 3 9
1866	52553 2 10	3 2	13252 13 0	19784 2 0	19516 7 10	19516 7 10	....	347472 2 11	13817 2 9	200382 5 9
1867	47323 0 4	3 2	14167 11 7	19898 0 4	13257 8 5	13257 8 5	....	331725 9 7	14628 8 6	220280 6 1
1868	49546 4 7	3 2	14314 17 9	20246 0 5	14985 6 5	14985 6 5	....	351035 10 4	15173 2 5	239683 15 6
1869	52736 18 4	3 2	15467 12 6	22688 14 4	14580 11 6	14580 11 6	....	395469 8 5	15387 15 7	262374 9 10
1870	65343 10 8	3 2	16784 13 8	24487 6 0	24071 11 0	24071 11 0	....	432941 1 9	17633 5 10	286861 15 10
Total	598457 14 8		163731 10 6	212728 5 2	222097 19 0	196115 14 7	25982 4 5		143599 3 2	

Average Composition and Quality of the Metropolitan Waters, in September, 1870.—The following are the returns of the Metropolitan Association of Medical Officers of Health:—

Names of Water Companies.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen.		Hardness.	
			As Nitrates, &c.	As Ammonia.	Before Boiling.	After Boiling.
Thames Water Comps.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	15·73	0·057	0·083	0·001	12·6	3·0
West Middlesex	15·60	0·033	0·091	0·000	12·1	2·9
Southwark and Vauxhall	15·33	0·060	0·065	0·001	12·6	3·4
Chelsea	15·70	0·069	0·075	0·002	12·6	3·0
Lambeth	16·17	0·064	0·075	0·001	12·8	3·3
Other Companies.						
Kent	27·00	0·007	0·125	0·000	18·9	5·3
New River	15·87	0·017	0·091	0·000	12·7	2·9
East London	15·37	0·017	0·110	0·001	12·0	2·9

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and, in the case of the metropolitan waters, the quantity of organic matter is about eight times the amount of oxygen required by it. The water was found to be clear and nearly colourless in all cases.

The average quantity of water supplied daily to the metropolis during the preceding month was, according to the returns of the water companies to the Association of Medical Officers of Health, 111,718,824 gallons; and the number of houses supplied was 481,149. This is at the rate of 34·4 gallons per head of the population daily. The last official return from Paris stated that the average daily supply per head of the population was 29·3 gallons; but this includes the water used for the public fountains, and for the ornamental waters in the Bois de Vincennes and the Bois de Boulogne.

H. Letheby, M.B.

Dr. Stevenson's Report on the Gas supplied by the Imperial Company to the Vestry of St. Pancras during the Month of September, 1870.

Date.	Number of Observations.	Average Light in Candles produced by 5 Ft. of Gas per Hour.	Light in Candles reduced to Consumption of 120 Grs. per Hour.	Traces of Ammonia.	Traces of Sulphuretted Hydrogen.
Sept. 14	10	13·3	14·4	Present.	None.
16	10	12·8	13·8	,,	,,
19	10	13·5	13·5	,,	,,
21	10	12·6	13·9	None.	,,
23	10	13·7	14·3	Present.	,,
26	10	12·8	13·2	None.	,,
28	10	13·0	13·8	,,	,,
30	10	12·6	13·7	,,	,,

The maximum illuminating power was 14·4 candles, the minimum 13·2 candles, the average 13·8 candles. These determinations were made with the same burner that has been used for the last two years. Of impurities, ammonia was present on four and absent on four occasions; sulphuretted hydrogen was never present; sulphur was present to the extent of 10·52 grains per 100 cubic feet

Thos. Stevenson.

Dr. Whitmore's Report on the Quality of the Water supplied in St. Marylebone, in August and September, 1870:—

August, 1870.	Total Solid Matter in degrees or grains per Imperial gallon.		* Loss by Incineration of Solid Matter in previous column.		Ammonia.
	Aug., 1869. 0°	Aug., 1870. 0°	Aug., 1869. 0°	Aug., 1870. 0°	0°
Distilled Water					
West Middlesex water	16·60	16·72	0·60	0·64	—
Grand Junction water	17·36	16·74	0·56	0·60	—
September, 1870.	Sept., 1868. 0°	Sept., 1870. 0°	Sept., 1869. 0°	Sept., 1870. 0°	0°
Distilled Water					
West Middlesex water	16·88	16·86	0·60	0·64	—
Grand Junction water	16·96	16·68	0·64	0·64	—

* The loss by incineration represents the amount of organic and other volatile matters contained in an Imperial gallon (70,000 grains) of water.

Dr. Whitmore's Report on the Quality of the Gas supplied in St. Marylebone, in August and September, 1870:—

August, 1870.	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quantity of Sulphur in 100 Cub. Ft.	Mean Quantity of Ammonia in 100 Cub. Ft.	Sulphuretted Hydrogen.
	*Mean of 24 Obser.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Imperial Company's gas	15·98	16·42	15·54	27·34	9·50	26·72	1·28	None.
Chartered Company's common gas	16·24	16·47	15·94	30·48	13·50	26·95	1·60	None.
Chartered Company's cannel gas	22·87	23·38	22·65	27·40	14·68	23·90	1·24	None.
Mean of daily readings of barometer . . . 29·87								
,, ,, ,, thermometer . . . 69·68								
September, 1870.	*Mean 16 Obs.							
Imperial Company's gas	15·84	16·72	14·96	23·81	9·72	28·13	1·95	None.
Chartered Company's common gas	16·09	16·38	15·75	30·27	14·57	26·86	1·28	None.
Chartered Company's cannel gas	22·94	23·52	22·49	27·61	13·37	26·23	2·00	None.
Mean of daily readings of barometer . . . 29·99								
,, ,, ,, thermometer . . . 65·33								

* Each observation consists of 10 readings of the photometer, at intervals of one minute

During August and September it will be seen, by reference to the above tables, that the gas of all the companies consumed in this parish maintained a high illuminating power; on one or two occasions only did the gas of the Chartered Company fall below the standard required by law, whilst the gas of the other two companies was always above the standard. The range of the Imperial gas was from 16·72 to 14·96 candles, of the Chartered common gas from 16·47 to 15·75 candles, and of the Chartered cannel gas from 23·52 to 22·49 candles. With regard to purity, it is satisfactory to observe that in all the gases the ammonia is reduced to an almost minimum quantity; the sulphur impurity, although still large, is less than has been found on most previous analyses; whilst sulphuretted hydrogen has on no single occasion been detected. The pressure of all the gases was uniformly good. The above results were obtained from the gas manufactured by the Imperial Company at their Fulham works, and from the Chartered Company's gas manufactured at their works, Horseferry Road, Westminster.

Register of New Patents.

2491.—HENRY JAMES HOGG KING, of Glasgow, in the co. of Lanark, N.B., engineer, for "*Improvements in apparatus for measuring, indicating, and regulating the flow or passage of liquids.*" Provisional protection only obtained. Dated Aug. 20, 1869.

In carrying out this invention the supply-pipe is fitted with a small branch which leads a portion of the liquid through the meter, whence it passes on by a small pipe into a small cylinder provided with a piston, and having an outlet slit in its side. The piston moves a large valve, through which the main portion of the liquid passes. When the liquid is being withdrawn, the more rapidly it issues the less will be the pressure on the outside of the valve-piston, and the farther will it move outwards, in doing which it will proportionally open the outlets from the meter and from the supply-pipe, so that the measurements of the meter will always be proportional to the actual discharge, whilst the position of the valve-piston will afford an indication of the rate of discharge at any moment.

2509.—WILLIAM ROBERT LAKE, of 8, Southampton Buildings, London, consulting engineer, for "*Improvements in posts or standards for gas-lamps.*" A communication. Patent dated Aug. 23, 1869.

The nature of the said invention consists in casting the lamp-post with a closed bottom, and having an opening at a proper height, into which is secured the service-pipe, while the top of the post is provided with a plug, short pipe, and stop-cock.

By constructing the post with all the openings in the base closed and made perfectly gas-tight, the base is converted into a condensing-chamber. The plug or stopper in the top of the post is preferably of cast iron, and is secured by lead or otherwise in the post. This stopper is drilled and tapped to receive the short piece of pipe to which the burner-cock and burner are attached. The base of the post is drilled above the closed bottom to receive the service-pipe proceeding from the street-main. This service-pipe is made in two pieces, and connected near the base of the post with a running thimble or other union or connexion. By this means the 10 or more feet of gas-pipe usually employed inside the post are saved. The large gas space inside the lamp-post prevents the freezing of the gas, and consequent obstruction of the delivery in the coldest weather. The dust, dirt, and condensation of moisture or impurities fall to the bottom without obstructing the entrance of gas at the opening, its passage to the burner, and exit at the same. The lamp-posts are more durable, because oxidation can take place only on the exterior. The said lamp-posts may be cast with the bottom closed, or a sleeve or short pipe, or other suitable connexion, may be secured to the bottom. An ordinary lamp-post may be fitted with a closed bottom in this manner.

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2534.—HENRY PALFREY STEPHENSON, of 15, Abingdon Street, in the city o. Westminster, civil engineer, EUGENE GEORGE BARTHOLOMEW, of 1, Chepstow Villas, York Road, Upper Holloway, in the co. of Middlesex, civil engineer' and ROBERT KING, of 8, St. Mary Axe, in the City of London, civil engineer, for "*Improvements in lighting and extinguishing gas-lamps.*" Patent dated Aug. 26, 1869.

This invention relates to certain improvements and arrangements in the mode of lighting street or other gas-lamps, in which the lighting and extinguishing are effected by the pressure and exhaustion of atmospheric air, or any gas or combination of gases, conveyed in an independent tube or pipe to that of the ordinary pipe.

The mode is as follows:—An independent tube, or other mode of conveyance, passes from lamp to lamp, and at each lamp communicates with a cylinder, over which is laid a diaphragm, or an expansible bellows more or less impervious to air. This diaphragm rises or falls according as pressure or exhaust exists in the tube communicating with the cylinder, and in doing so influences by any suitable mechanical arrangement a lever attached to the valve or cock by which the gas is admitted from the main to the burner. The play of the lever is limited, so that the gas is never wholly turned off, but remains burning to a greatly reduced extent. A shield intended to protect the reduced flame from the action of currents of air is so arranged as that it can be raised or lowered simultaneously with the motion of the aforesaid lever, so that when the gas is partially turned off the shield is in a position to protect the reduced flame.

The claim is for the employment of mechanism actuated by a pressure or exhaustion of air, or other gases or combination of gases, passed through a separate pipe or tube, for turning the plug of a gas-tap and raising and lowering a shield, substantially in the manner before referred to.

2561.—JOHN LOADER, of Upper Clifton Street, Worship Square, in the co. of Middlesex, for "*Improvements in rotary engines and pumps.*" Patent dated Aug. 28, 1869.

According to this invention a central shaft or axis, having a crank-pin or eccentric formed on or carried thereby is passed through a cylinder, and on such crank-pin or eccentric is mounted a disc or piston which is carried round thereby with its periphery in contact with the inner periphery of the cylinder, as has heretofore been proposed, but instead of allowing the disc or piston to completely revolve upon its axis, it is only allowed slightly to rock to and fro thereon by connecting the stop or abutment to such disc or piston by means of a cylindrical joint, which may be connected to the stop or abutment, in which case the stop or abutment may be rigidly fixed in the cylinder, and may pass through the two parts of a cylindrical joint working in a correspondingly formed recess within the disc or piston, a suitable space being formed within the disc or piston to receive the stop or abutment as the disc or piston is carried round by the crank-pin or eccentric on which it is mounted, the two parts of the cylindrical joint being forced together in any suitable manner, so as to make a tight joint at those parts.

2580.—THOMAS WILSON, of Birmingham, in the co. of Warwick, gun manufacturer, for "*Improvements in screw and ratchet wrenches, part of which improvements is also applicable to pipe-cutters.*" Patent dated Sept. 1, 1869.

According to this invention one end of the adjusting-screw of the screw-wrench is attached to and supported by the solid or fixed jaw of the wrench. The opposite end of the adjusting screw is made to engage with the moveable jaw of the wrench. On turning the adjusting-screw by a milled head or collar, the moveable jaw is made to advance to or retire from the fixed jaw as may be required.

2587.—BERNARD ISAAGE, of 3, Ile Lacroix, in the city of Rouen, in the empire of France, civil engineer, for "*Improvements in apparatus for indicating and registering the pressure of steam or other gases or liquids.*" Patent dated Sept. 1, 1869.

This invention consists in providing a case or box made of iron, tin, or other appropriate material, which may be locked or unlocked as required, containing a clockwork fitted with hands and a dial-plate for denoting the hours and minutes, and having a suitable aperture closed with a piece of glass or other transparent material over the dial-plate. To the axis or spindle of the clockwork is fitted or attached a cylinder or cylindrical casing, upon the surface of which is fixed a sheet of paper or other suitable material, upon which are ruled two series of lines perpendicular to each other in one direction. There may be either 24, 12, or such other number of lines as correspond to the number of hours of the period during which the pressure is to be registered, and at right angles to these there may be another series of lines, drawn in such a manner that the distances of or spaces between any two successive lines represent or correspond to either one pound on every square inch, one atmosphere, or such other unit of pressure as may be used or employed in each case or instance.

2604.—JAMES GASCOIGNE LYNDE, of Manchester, in the co. of Lancaster, civil engineer, for "*A diaphragm indicator especially adapted for water and other meters.*" Provisional protection only obtained. Sept. 4, 1869.

According to this invention, the stuffing-box and connexions employed in the ordinary diaphragm meters are dispensed with, and in lieu thereof the diaphragm is made of two sheets of vulcanized india-rubber or other suitable material, with a space left across and in the centre of the diaphragm. The space through the diaphragm is for the purpose of admitting a rod of whalebone or other flexible material, which rod is secured at one end in front of the body or casing of the diaphragm-chamber. At the other end the rod passes through the joint, and projects beyond the diaphragm-chamber, a small metal tube being inserted into the diaphragm to protect the whalebone rod where it passes through the joint in the casing at the loose end, where it must work freely.

2623.—FRIEDRICH WICKE, of Bockenheim, Prussia, sugar manufacturer JULIUS BRÖNNER, manufacturer, THEODOR PETERSEN, chemist, and JOHANN GEORG ZEHFUSS, professor, all of Frankfort-on-the-Maine, in the kingdom of Prussia, for "*Certain improvements in the treatment of human excrements, whereby they are converted into an inodorous, dry, and easily portable manure.*" Patent dated Sept. 6, 1869.

The object of this invention is to convert human excrements into an almost scentless, dry, easily transportable guano-like mass while preserving their full manuring value. This object is attained by concentrating and disinfecting the excrements *in vacuo* by means of steam and of hot products of combustion, which are led direct from the fireplaces in which they are produced into the excrements. The mass may also be mixed with disinfecting substances (calcined excrements or earth, for example), to further ensure its complete disinfection.

2648.—JAN ANTHONY MULLER, of Amsterdam, in the kingdom of Holland, at present of 123, Chancery Lane, in the co. of Middlesex, for "*Improvements in apparatus for measuring and registering the flow of water and other liquids, part of which improvements is applicable to measuring and registering the flow of gases.*" Patent dated Sept. 8, 1869.

This invention consists of a pipe having two inverted hollow cones meeting at an apex, from which a small opening passes to a valve-chamber wherein is an india-rubber valve. Above the valve-chamber is a hollow air-tight chamber, wherein is a tube perforated at either end, the perforations pointing in opposite directions to each other, after the manner of a turbine. An opening for the passage of air into the turbine is provided at the top of a vertical pipe affixed to the horizontal tube, the vertical pipe being free to revolve on pivots through an opening in the cover of the air-tight chamber.

2685.—WILLIAM EDWARD NEWTON, of 66, Chancery Lane, in the co. of Middlesex, civil engineer, for "*An improvement in pumps.*" A communication. Patent dated Sept. 14, 1869.

These improvements consist in lining the inner surfaces of the cylinders and air-chambers with a coating of porcelain, porcelain enamel, or other vitreous material of similar nature, which will be not only an efficient protection against rust or oxidation of the metal, but will present a smooth and comparatively frictionless surface, and will be impenetrable to air.

2719.—NICHOLAS JOSEPH DOR, of Ampsin, Province of Liège, Belgium, for "*A new method of and apparatus for manufacturing crucibles, muffles, gas retorts, melting-pots, and other analogous vessels, through the agency of hydraulic presses.*" Patent dated Sept. 18, 1869.

The object of this invention is to manufacture economically crucibles, melting-pots, and other refractory vessels suitable to be employed in the production of volatile metals, the manufacture of illuminating gas, melting metals, alloys, glass, and other substances.

By means of the present improvements it is intended that the materials of which such vessels are made shall be rendered sufficiently compact and solid neither to allow of the passage of gases nor of their being attacked or eaten away by the scoriæ, although submitted to very great heat. This result is obtained by the combined use of several hydraulic presses so as to give to the plastic material the requisite compactness by submitting it to great pressure, which is equally spread over all parts of the vessel to be manufactured.

2731.—ALFRED TYLOR, of Newgate Street, in the City of London, brassfounder, for "*Improvements in water-taps and cistern apparatus for preventing the waste of water and for cleanliness.*" Patent dated Sept. 20, 1869.

This invention consists in fixing a metal cylinder or box enclosing a strong jack or other spring electro-brassed on to the cover of a diaphragm screw-down tap. The spindle of the tap passes through the box containing the spring, and is attached to the spring. At the top of this spindle is attached a T-handle or a circular flange, with a milled edge or a cone or other shaped knob, to which it is impossible to attach a cord. By means of this flange or cone the spindle of the valve can be turned by the hand, and the valve over the water-way of the tap opened, so that water may pass through the tap. When the hand is released from the milled edge of flange or conical knob, the said spring comes into action, turns the spindle round, and closes the valve even against a pressure of 300 feet column of water. The tap is not liable to be kept open after the hand is removed. The spring can be adjusted so as to close the valve in a half turn if required, or less quickly if the screw on the spindle requires more turning before the valve is closed.

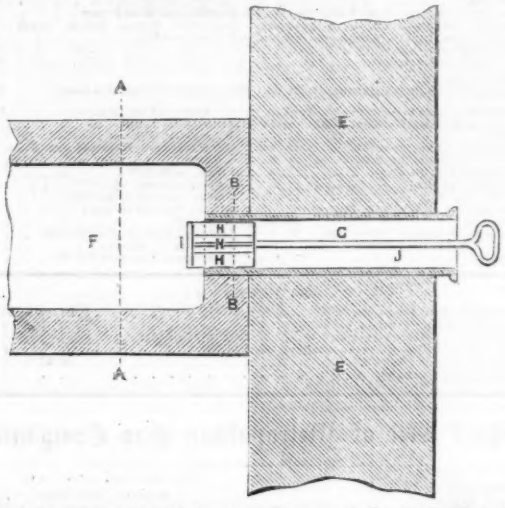
2739.—HENRY COCKEY and FRANCIS CHRISTOPHER COCKEY, of Frome Selwood, in the co. of Somerset, for "*Improvements in apparatus for scurfing retorts.*" Patent dated Sept. 21, 1869.

This invention has for its object the more ready removal of the carbon which adheres to the interior of retorts used in the manufacture of gas, and especially from the angles at the back end thereof where it collects, and where great difficulty is experienced in detaching it by the means usually employed without damaging the retort.

The apparatus consists of a pipe about 5 or 6 inches, more or less, in diameter, which is inserted in the back end of the retort, and projects through the wall of the retort-bench. The pipe is fitted with a metal plate or disc of such a size as, while it nearly covers the area, allows it to pass freely backwards and forwards when required. A rod is fixed to the centre of the plate, and terminates in a handle at the other end. Attached to the rod and also to the plate before mentioned are wings or radial plates so disposed as to divide and direct any current

of air that may pass through the pipe. When not in use the pipe is closed by a cover.

The engraving represents a sectional elevation of the apparatus and part of the retort to which it is applied. E is the back wall of the retort-bench; F, the retort; C, the pipe; H, the radial wings or plates; and I, the disc; J is the rod by which the disc is introduced.



When it is necessary to scurf the retort, the cover of the pipe is taken off, and the plate or disc is passed through the pipe C, so as to extend a short distance beyond the orifice of the pipe in the retort. The lid of the retort is put on and luted in the usual way, and the cover or plug of the ascension-pipe is removed; this causes a current of air to pass through the pipe at the back and into and through the retort, but being intercepted by the plates, is directed against that part of the retort in which the carbon collects, and under ordinary circumstances offers the greatest resistance to its removal. By these means, however, the carbon, if not wholly consumed, is soon displaced, and may be cleared away by any convenient method. The form, size, and number of the plates may be varied to suit the kind of retort they are employed with.

2751.—ENOCH HILL, of Longton, in the co. of Stafford, engineer, for "*Improvements in slide-valves.*" Patent dated Sept. 22, 1869.

This invention consists in making valves hollow, for the purposes of admitting steam therein and through, whereby a considerable area of the valve is saved from being exposed to the pressure of steam used. Also in making valves of a (downward) tapering form (in section), working in a tapering slide made to receive them. The object of the improvements is to obtain a more perfect equilibrium, and to reduce friction, thereby saving power and wear and tear, and also to render the starting, stopping, and general management of the engine to which they may be applied more easy than heretofore.

2752.—ROBERT RENTON GIBBS, of Liverpool, in the co. of Lancaster, engineer, for "*Improvements in pumps, vacuum-pumps, and blast-engines, and in lubricators for the same, which are also applicable to other lubricating purposes.*" Patent dated Sept. 22, 1869.

The first part of this invention consists in the employment in pumps, vacuum-pumps, and blast-engines, of a sliding valve or valves, worked by the same mechanical power or force as the pump itself, instead of loose valves. The second part consists in regulating the quantity of water or air ejected. A sliding link is united to the piston or plunger, the other end of which is in connexion with a lever capable of receiving when required a to-and-fro motion, and provided with a rod taking into the teeth of a quadrant for retaining the lever in any particular position when required. The third part consists in providing a reservoir for grease, oil, or other lubricating material, immediately over the stuffing in combination with a casing, to shield it from dust and sight, and at the same time made in one casting with the rest of the gland.

2754.—JOHN TARBUCK and THOMAS BURNS, of Abram, near Wigan, in the co. of Lancaster, for "*Improvements in the method of pumping water from shafts, pits, or similar places, which method is also applicable for drawing gas from goaves in mines, and for ventilating pits or shafts in course of sinking.*" Provisional protection only obtained. Dated Sept. 22, 1869.

According to this invention it is proposed to utilize the atmospheric pressure quite up to the required point of delivery of the water. On the lower end of the pump-stock is placed a sliding pipe kept tight by packing, and the end of this pipe is immersed in the water to any convenient depth when exhausting, and the foot of the pump-stock is some distance above the water. This sliding pipe can be lifted to any required height above the surface of the water by means of one or more wire ropes outside the pump-stock, passing up the pit, downthrow, or other excavation, and connected to an L-lever or other suitable apparatus, the length of the stroke being regulated as required. The air from the pump-stock is exhausted by means of one or more air-pumps placed in any convenient position, and when a column of water has been elevated by atmospheric pressure to the height previously named, the sliding pipe is raised, and on the emergence of the lower end from the surface of the water, the column will be immediately severed, and the atmospheric air will have the means of ingress into the pump-stock, pursuing and driving before it the upper portion of the so severed column of water to its required point of exit from the pump-stock.

2775.—JOHN FAULKNER, of the city of Manchester, in the co. of Lancaster, for "*Improvements in exhausting, drawing, or draining the gas from coal and coal mines.*" Provisional protection only obtained. Dated Sept. 24, 1869.

This invention consists in affording every facility for the gas to escape and to be drawn off by fans, turbines, exhaust-pumps, heat, or other mechanical means. Where gas is known to exist, holes are tapped or drilled in the wall, and pipes connected to the holes, the gas being exhausted by means before mentioned. Known blowers are tapped with a large hole either in the solid or at the fracture, but the solid is preferred, as there is more certainty in governing the escape; and when it is unsafe for the gas to enter the ordinary air courses, pipes, sewers, or passages are provided to allow it to flow away to a safe place, or to be collected in chambers, and then drained off in non-working hours or otherwise as convenient.

2805.—ROBERT HARLOW, of Heaton Norris, in the co. of Lancaster, brass-founder, for "*Improvements in valves or cocks.*" Patent dated Sept. 27, 1869.

These improvements consist in the use and application of cupped vulcanized india-rubber washers or buffer-valves, fixed in the body of such cocks or valves, and through or into which cupped washers or buffer-valves the spindle for opening or closing the valve passes, such spindle either being solid or forming the passage for the liquid or fluid by being made hollow.

2809.—JOHN RICHARDSON WIGHAM, of Albany House, Monkstown, in the co. of Dublin, Ireland, for "*Improvements in the means and apparatus employed in illuminating buoys, beacons, lighthouses, and other establishments or localities, which improvements are partly applicable to other purposes.*" Patent dated Sept. 27, 1869.

One part of this invention has for its object to allow of the pipes conveying illuminating gas from works on land to buoys, beacons, or lighthouses, to be laid along undulating ground or declivities under or above water without having an accumulation of water (resulting from the condensation of the watery or other vapour in the gas) at the lowest points of the various undulations or declivities, resulting either in the entire interception of the flow of gas or in the production of a "jumping" of the gas-flames. For this purpose the gas before entering the gas-mains is caused to be passed through chambers or vessels either containing bichloride of calcium or other suitable substance having a great affinity for water; or the vessel may be provided with pipes, tubes, or passages cooled externally or internally by the application of a cooling medium at a low temperature, through the interior or against the exterior of which tubes the gas is made to pass, whereby all aqueous or other vapour capable of condensing and stopping up partly or wholly the gas-pipes is condensed, and therefore removed from the gas or neutralized.

Another part of the invention consists in the employment of an electric current for igniting illuminating gas in buoys, beacons, and lighthouses, such electric current being either produced by ordinary batteries, magnets, electric machines, or electro-magnetic machines situated at convenient places on land, and conveyed to the buoys, beacons, or lighthouses by means of a submerged insulated conducting wire, the current being there intercepted in close contiguity to the gas burner or burners so as to produce electric sparks at such points; or a system of electric batteries laid on the bottom of the sea is employed for this purpose, constructed in a similar manner to the ordinary voltaic pile, by which, from the action of the sea water, a constant current of electricity may be obtained. This system of submarine electric batteries, owing to the almost unlimited extent to which it can be applied, is also used for illuminating buoys, beacons, and lighthouses, as also establishments on land, by means of the light from the electric currents produced; and is also employed for any other purposes requiring a large quantity of electricity.

Another part of the invention consists in the employment of governors of any suitable known construction for the purpose of rendering the pressure of the gas itself available for extinguishing, raising, or lowering gas-flames on buoys, beacons, and lighthouses, for which purpose the valve or other moving part of such governors is connected by means of rods, links, chains, or other equivalent appliances to the cocks or valves admitting the supply of gas to the burners, so as to cause the motion of such valve, or other moving part of the governor, to effect the opening or closing of the said cocks or valves.

2836.—ALEXANDER FAIRLIE WILSON, of Parà, in Brazil, but at present staying at 3, Victoria Street, in the city of Westminster, engineer, for "*Improvements in the mode of and apparatus for utilizing waste heat from the furnaces of gas-retorts.*" Provisional protection only obtained. Dated Sept. Sept. 30, 1869.

This invention consists in utilizing the products of combustion or waste heat, escaping from retort-ovens into the main flues, for heating the air before its admission to the furnaces for sustaining combustion therein. This may be done in various ways, but by preference chambers are constructed above the retort-benches, or otherwise, and such chambers are divided by means of walls or partitions, so as to form large flues or passages arranged to cause the products of combustion to travel backwards and forwards along the chambers. Within these tubes or passages are placed tubes, through which the air for admission into the furnaces is passed, so as to raise its temperature on its way to the fires, and thus to effect considerable economy in the consumption of fuel.

APPLICATIONS FOR LETTERS PATENT.

2656.—MARTYN JOHN ROBERTS, of Pendarren, near Crickhowell, in the co. of Brecon, esquire, for "*Improved means or apparatus for stopping or regulating the flow of fluids, gases, or steam.*" Oct. 7, 1870.

2664.—ANDREW M'NIEL, of Tiverton, in the co. of Devon, engineer, and WILLIAM WHEATON, of Exeter, in the said co., merchant, for "*Improvements in the process of revivifying the materials used for the purification of gas.*" Oct. 7, 1870.

2667.—HENRY LYON, of the city of Manchester, manager of gas-works, for "*Improvements in apparatus for indicating and measuring quantities.*" Oct. 8, 1870.

2672.—ADOLPHUS FRANKENBERG, of Manchester, in the co. of Lancaster, for "*Improvements in apparatus for measuring and registering the flow of liquids.*" Oct. 8, 1870.

2710.—JAMES BAIN, of Liverpool, in the co. of Lancaster, engineer, for "*Improvements in double-acting pumps.*" Oct. 14, 1870.

2730.—JOHN STALVIES, of Bromsgrove, in the co. of Worcester, locomotive superintendent, for "*Improvements in gas-stoves for heating and warming rooms, and for other like purposes.*" Oct. 17, 1870.

GRANTS OF PROVISIONAL PROTECTION.

2522.—ADOLPHUS FRANKENBERG, of Manchester, in the co. of Lancaster, for "*Improvements in apparatus for raising and drawing off liquids.*" Sept. 20, 1870.

2534.—FERRAR FENTON, of Dewsbury, in the co. of York, and SAMUEL HOLLINS, of Bolton, in the co. of Lancaster, for "*Improvements in the deodorization and utilization of sewage or other feculent or putrescent matter, whether in a solid, fluid, or semi-fluid state.*" Sept. 21, 1870.

2554.—WILLIAM FIRTH, of Rose Villa, Viewforth, Edinburgh, secretary to the North British Rubber Company, Limited, for "*Improvements in steam, air, and gas, and in fluid or hydraulic engines.*" Sept. 23, 1870.

2570.—HERBERT JOHN JONES, of Peckham Rye, in the co. of Surrey, for "*Improvements in the construction of drain-pipes, and in the mode of obtaining access thereto for forming connexions therewith or for cleansing or examining the same.*" Sept. 26, 1870.

2591.—GEORGE SYMES, of Goding Street, Vauxhall, in the co. of Surrey, engineer, for "*Improvements in portable apparatus for manufacturing gas.*" Sept. 29, 1870.

2618.—FREDERICK JAMES HEAD, of Eastbourne, in the co. of Sussex, engineer, for "*Improvements in the construction of cocks and valves.*" Oct. 1, 1870.

2631.—JOSEPH ALFRED ROTHWELL, of Ramsbottom, in the co. of Lancaster, for "*Improvements in stop-valves.*" Oct. 4, 1870.

2656.—MARTYN JOHN ROBERTS, of Pendarren, near Crickhowell, in the co. of Brecon, esquire, for "*Improved means or apparatus for stopping or regulating the flow of fluids, gases, or steam.*" Oct. 7, 1870.

2664.—ANDREW M'NIEL, of Tiverton, in the co. of Devon, engineer, and WILLIAM WHEATON, of Exeter, in the same co., merchant, for "*Improvements in the process of revivifying the materials used for the purification of gas.*" Oct. 7, 1870.

2672.—ADOLPHUS FRANKENBERG, of Manchester, in the co. of Lancaster, for "*Improvements in apparatus for measuring and registering the flow of liquids.*" Oct. 8, 1870.

NOTICES TO PROCEED.

1570.—CHARLES DENTON ABEL, of 20, Southampton Buildings, Chancery Lane, in the co. of Middlesex, patent agent, for "*Improvements in the manufacture of wrought-metal tubes, and in machinery or apparatus employed for that purpose.*" A communication. May 30, 1870.

1625.—EDMUND RATCLIFF, of Birmingham, in the co. of Warwick, lamp and chandelier manufacturer, for "*Certain improvements in vestibule-lamps.*" June 4, 1870.

1634.—ALFRED WILLMER POCOCK, of Pimlico, in the co. of Middlesex, engineer, for "*Improvements in meters, pumps, or other engines for water or other liquids.*" June 6, 1870.

1640.—WILLIAM WILSON, of the city of Manchester, ironmonger, for "*Improvements in and apparatus for manufacturing gas for illuminating and heating from coal oils.*" June 7, 1870.

1679.—ROBERT THOMAS YEADON JOHNSON, of Stockton-on-Tees, engineer, for "*Improvements in rotary engines and pumps.*" June 10, 1870.

1715.—ROBERT MILLER, of Gartcosh, in the co. of Lanark, N.B., for "*Improvements in the manufacture of clay or earthenware pipes, and in the mechanism employed therefor.*" June 15, 1870.

1952.—WILLIAM MARRIOTT, of Huddersfield, in the co. of York, for "*Improvements in the manufacture of iron salts or compounds, and in the purification of gas.*" July 9, 1870.

2377.—THOMAS ATKINS, of St. Albans, in the co. of Herts, for "*Improvements in apparatus for economizing the waste heat and gases from furnaces, and in means for generating, collecting, and purifying gases, such gases being applicable to various useful purposes.*" Aug. 31, 1870.

2534.—FERRAR FENTON, of Dewsbury, in the co. of York, and SAMUEL HOLLINS, of Bolton, in the co. of Lancaster, for "*Improvements in the deodorization and utilization of sewage or other feculent or putrescent matter, whether in a solid, fluid, or semi-fluid state.*" Sept. 21, 1870.

2554.—WILLIAM FIRTH, of Rose Villa, Viewforth, Edinburgh, Scotland, secretary to the North British Rubber Company, Limited, for "*Improvements in steam, air, and gas, and in fluid or hydraulic engines.*" Sept. 23, 1870.

2633.—GEORGE HASELTINE, of Southampton Buildings, London, for "*Improvements in combined lifting and force pumps.*" A communication. Oct. 4, 1870.

NOTICE OF APPLICATION FOR LEAVE TO ENTER A DISCLAIMER AND MEMORANDUM OF ALTERATION.

1748.—GEORGE M'KENZIE, of Glasgow, in the co. of Lanark, N.B., for "*Improvements in the manufacture of illuminating gas.*" June 15, 1867.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

2674.—CHARLES RITCHIE, "*Improvements in apparatus for regulating automatically the supply of gas, air, and water, or any one or more of them, to steam-boilers heated by gas or otherwise, and for utilizing the heat of the gases produced or heated by combustion.*" Sept. 23, 1867.

2692.—THOMAS HENRY WILLIAMS, "*An improvement in gas-burners.*" Sept. 24, 1867.

2716.—GEORGE WILKINSON, "*Improvements in pumps.*" Sept. 26, 1867.

2811.—NATHANIEL FORTESCUE TAYLOR, "*Improvements in means or apparatus to be used in impregnating air and aëriform fluids or gases with hydrocarbons, and in burners used in burning the inflammable air obtained, which burners are also applicable when burning other gaseous fluids.*" Oct. 5, 1867.

2840.—WILLIAM POTTS, "*Improvements in gaseliers.*" Oct. 9, 1867.

2847.—RICHARD BROTHERTON and JOSEPH WALDRON, "*Improvements in the manufacture of lamp-posts.*" Oct. 10, 1867.

2854.—JOHN WITHINSHAW and JOHN EDWARD BAKER, "*Improvements in the means or machinery for working or actuating the slide-valves of steam-pumps and blowing-machines.*" Oct. 11, 1867.

2859.—JULIUS BRÖNNER, "*An improvement in the construction of gas-burners.*" Oct. 11, 1867.

2873.—RICHARD CANHAM and JAMES THOMSON, "*Improvements in stoves for consuming gas and other fuel, and in ovens to be used therewith.*" Oct. 12, 1867.

2894.—THOMAS HENRY BAKER and THOMAS WOODROFFE, "*Improvements in treating sewage or other liquid matters, so as to purify the more fluid portions thereof, and recover some of the contained matters for re-use in manufacturing processes, and in the preparation of others for use as manures.*" Oct. 15, 1867.

Price Current.

CASTINGS.—*Per Ton.*

Average Weight of Cast-iron Gas-pipes, per Yard.

1 in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	29	33	51	70	89	107	126	149	177	208 lb.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle and Middlesboro'.	Wales.	Yorkshire, Derbyshire, and Staffordshire.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Pig Iron, No. 1 (g.m.b.)	3 15 0	3 12 6	3 9 6	3 10 0	3 15 0
1¼ and 2-inch Socket-pipes	7 0 0	5 14 0	5 10 0	6 0 0	7 0 0
2½ and 3-inch ditto	6 10 0	5 4 0	5 0 0	5 15 0	6 10 0
4 and 5-inch ditto	6 0 0	4 15 0	4 10 0	5 5 0	6 0 0
6 inches and upwards ditto	5 15 0	4 5 0	4 0 0	5 0 0	5 15 0
Retorts, 1st fusion, hot blast	5 10 0	4 10 0	4 5 0	5 0 0	5 10 0
Ditto, 2nd ditto, cold ditto	6 10 0	—	—	—	6 10 0
Tank-plates, ¼ thick and above	6 0 0	5 0 0	4 15 0	5 10 0	6 0 0

WROUGHT-IRON TUBING,

Subject to 60 per cent. Discount.

	½ in.	1¼ in.	1½ in.	1 in.	¾ in.	½ in.
Patent Welded Tubes, from 2 to 14 feet—per foot	s. d. 1 8	s. d. 1 1	s. d. 0 10	s. d. 0 7	s. d. 0 5	s. d. 0 4½
Ditto ditto, from 12 in. to 23½ in.—each	3 0	2 0	1 6	1 1	0 9	0 8
Long Screws, from 12 in. upwards	4 0	2 3	2 0	1 6	1 2	0 11
Bends and Springs	4 3	2 3	1 9	1 3	0 11	0 9
Square Elbows, equal or reducing; Round Elbows, 5 per cent. extra	3 9	2 3	1 9	1 3	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 9
Crosses, ditto, equal or reducing	4 9	3 6	3 0	2 3	1 9	1 6
Iron Cocks	20 9	13 0	10 9	7 3	5 0	3 8
Ditto, with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Nipples	1 3	0 9	0 8	0 6	0 5	0 4½
Plain Sockets	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 2-quart	15 0	14 0	13 6	13 0	12 0	—

FREIGHTS.

Coastwise—Newcastle:—	Per Ton.	*Foreign:—*	Per Keel.
Chatham and Rochester . . 6s. 3d.	6s. 6d	Barcelona	£19 0s
Cork	8 0	Bordeaux	10 0
Dover, Folkestone, and Ramsgate	7 0	Boulogne and Calais	8 0
Dublin	8 6	Cadiz	11 10
Exeter Quay	8 3	Cronstadt	—
Ipswich	6 0	Copenhagen	8 0
London (from Leith)	8 6	Genoa	15 10
London (Pool)	6 6	Hamburg	10 10
Lowestoft and Yarmouth	5 0	Havre de Grace	10 10
Portsmouth & Southampton	7 9	Leghorn	17 0
Plymouth	8 0	Lisbon	11 5
Shoreham	8 0	Rotterdam	—
Whitstable	6 9	Stettin	12 0
Weymouth	7 9	Trieste	15 10
		Venice	18 10

GAS COALS.

Newcastle—Unscreened:—	Per Ton.
	6s. 6d.
Haswells, Nettlesworth Primrose, and South Pelaw	
Felling, Framwell Gate, North Pelton, Redheugh Main, Walker's Primrose, West Wear, and Whitwell Primrose	6 9
Burnhope, Craghead, Charlaw, Derwent, East Castle, Edmondsley, Eighton Moor, Hartlepool Pelaw, Holmside, Lambton's Gas, Lanchester Pelaw, Medomsley, Mickley, New Pelaw, Pelaw Main, Ravensworth, Seaham, South Moor Pelton, South Leverson, Townley Main, Tyne Main, West Pelaw, Wearmouth Hutton, and Witton	7 0
Peareth, Ravensworth Pelaw, Waldridge, West Garesfield, and West Pelton	7 3
Brancepeth, Dean's Primrose, Londonderry Gas, New Pelton, Pelton, South Peareth, Stella, Urpeth, Washington Hutton, and West Leverson	7 6
Ramsay's Newcastle Cannel	15 0
Wigan Cannel (at Liverpool)	17 0
Welsh Cannel:—	
Coppa Cannel (on rails at Birkenhead), 13s. 6d.; ditto (on rails at Connah's Quay)	13 0

Scotch Cannel, f.o.b.:—	Per Ton.	*Scotch Cannel*, f.o.b.:—	Per Ton.
Boghead—at Bo'ness, 47s. 6d.; at Leith 48s. 2d		Arniston (at Leith)	21s. 0d
Muirkirk	27 0	Wemyss (at Wemyss)	20 0
Kirkness, best (at Burntisland)	22 6	Haywood Co.'s Haywood (at Granton)	20 0
Capeldrae, 1st quality (at ditto)	22 6	Pirnie, or Methill	17 0
Ditto, 2nd ditto (at ditto)	17 6	Lothian's Cannel (at Leith)	24 6
Cowdenbeath (at ditto)	12 0	Grange ditto (at Bridgeness)	17 6
Lochgelly (at ditto)	12 0	Kinniel ditto (at Bo'ness)	17 6
Donnibristle—at Burntisland, 12s.; at Aberdour	12 6	Myles' ditto	33 6
Auchinheath Lesmahago (at Granton)	27 0	Lochore Parrot (at Burntisland)	22 6
Duke of Hamilton's Lesmahago (at Granton)	27 0	Lanemark (at Glasgow)	16 0
		Elphinstone Tower (at Leith)	20 0

SUNDRIES.

Best Newcastle Fire-bricks, per 100	£2 10s. to £3 15s. 0d.
Cliff's Fire-bricks (at Wortley), per 1000	2 15 0
Ingham's ditto (at Wortley), per 1000	2 15 0
Farnley Iron Co.'s Fire-bricks (at Wortley), less discount	2 17 0
Fire-clay Retorts, per foot run	5s. 6d. to 0 7 6
Tarred Rope Yarn, per cwt.	1 0 0

Share List of Metropolitan Gas Companies.

Number of Shares issued.	Amount per Share.	Name of Company.	Amount paid up p. Share.	Dividend p. Cent. p. Annum.	Latest Quotations.
	£		£ s. d.	£ s. d.	£
8000	10	Anglo-Romano	10 0 0	10 0 0	11 — 12
5000	20	Bahia (Limited)	20 0 0	3 0 0	13 — 14
1000	20	Do., preference	20 0 0	10 0 0	25 — 26
750	20	Do., do., redeemable	20 0 0	10 0 0	20 — 22
40000	5	Bombay (Limited)	5 0 0	4 10 0	6 — 6¼
10000	5	Do., third issue	4 0 0	4 10 0	5 — 5¼
10000	20	British (Limited) (Norwich, Hull-Sculcoates, Hanley, Tunstall & Shelton [Potteries], Trowbdge., & Holywll.)	20 0 0	10 0 0	30 — 31
7500	20	Cagliari (Limited)	20 0 0	7 0 0	
112000	10	*Chartered*	10 0 0	8 0 0	15 — 16
8000	10	Do., A shares	5 0 0	8 0 0	6¾ — 6⅞
10000	10	Do., B shares, 4 per cent. max.	10 0 0	4 0 0	6¾ — 7
25000	10	Do., 5 per cent. preference	4 0 0	5 0 0	5¾ — 6
20000	10	Do., 10 per cent. preference	10 0 0	10 0 0	19 — 20
17490	25	*Commercial*	25 0 0	10 0 0	41 — 43
20000	20	Continental Union	20 0 0	8 0 0	25½ — 26½
10000	10	Do., new	5 0 0		7 — 7½
5213	20	Do., preference	20 0 0	7 0 0	24 — 26
5000	10	*Crystal Palace District*	10 0 0	10 0 0	16 — 16½
5000	10	Do., preference	10 0 0	6 0 0	11 — 11½
10000	10	Do., new shares	10 0 0	7 0 0	12 — 12½
4000	50	*Equitable*	50 0 0	10 0 0	80 — 83
4000	25	Do., new shares	25 0 0	10 0 0	40 — 41½
23406	10	European (Limited)	10 0 0	11 0 0	15 — 15½
12000	10	Do., new shares (Boulogne, Amiens, Rouen, Caen, Havre, & Nantes.)	5 0 0	11 0 0	7¼ — 8
5000	10	Hong Kong (Limited)	10 0 0	9 0 0	11 — 12
26000	50	*Imperial*	50 0 0	10 0 0	83 — 85
26000	10	Do., new shares	7 0 0	10 0 0	12½ — 13
26000	12½	Do., new shares	12 10 0	7 0 0	14½ — 15½
25000	12½	Do., new shares, 1870	2 10 0	7 0 0	3½ — 4
1300	100	Do., bonds	£100	10 0 0	175 —180
56000	50	*Imperial Continental* (Amsterdam, Berlin, Ghent, Hanover, Lille, Rotterdam, Aix-la-Chapelle, Antwerp, Bordeaux, Brussels, Cologne, Frankfort-on-Maine, Haarlem, Stolberg, Toulouse, & Vienna.)	43 15 0	9 2 6	64 — 66
400	100	Imperial Mexican (Limited)	100 0 0	nil.	
200	100	Do., new	100 0 0	nil.	
3000	40	*Independent*	40 0 0	10 0 0	64 — 65
3000	10	Do.	10 0 0	5 0 0	7 — 8
3000	20	Do.	15 0 0	7 10 0	17 — 18
7133	50	*London*	50 0 0	10 0 0	81 — 83
5610	25	Do., 1st preference	25 0 0	6 0 0	27 — 29
503	50	Do., 2nd preference	50 0 0	6 0 0	
214	50	Do., 3rd preference	50 0 0	6 0 0	
£18781		Do., 1st preference stock		6 0 0	
£11828		Do., 2nd preference stock		5 0 0	
		Nictheroy, Brazil (Limited)			
15000	5	Malta and Mediterranean (Limited)	5 0 0	4 10 0	3¾ — 4
6000	5	Do., preference	5 0 0	7 0 0	4¾ — 5¼
20000	5	Mauritius (Limited)	1 0 0		1 — 1¼
30000	5	Oriental (Calcutta)	5 0 0	10 0 0	3 — 3¼
30000	5	Do., new shares	1 10 0	10 0 0	3¼ — 3½
10000	5	Ottoman (Limited)	5 0 0	nil.	2 — 2½
14000	10	Pará (Limited)	10 0 0	10 0 0	10 — 11
27000	20	*Phœniz*	20 0 0	10 0 0	33 — 35
3600	100	Do., new	40 0 0	7 10 0	46 — 47
144000	8k.	Do.	100 0 0	5 0 0	82 — 84
5000	20	*Ratcliff*	20 0 0	10 0 0	28 — 29
20	20	Rio de Janeiro (Limited)	20 0 0	10 0 0	28 — 29
6959	5	Singapore (Limited)	5 0 0	7 0 0	
2000	5	Do., preference	5 0 0	7 10 0	
1500	32½	Shanghai	32 10 0	12 0 0	
4000	50	*South Metropolitan*	50 0 0	10 0 0	88 — 89
4000	12½	Do.	12 10 0	10 0 0	21½ — 22
20000	12½	Do., new shares	2 10 0	10 0 0	6 — 6¼
15000	10	*Surrey Consumers*	10 0 0	10 0 0	16¼ — 16½
10000	10	Do., new	6 0 0	10 0 0	10 — 10½
9000	4	United General (Limerick)	4 0 0	5 0 0	2¼ — 2½
1500	10	*Wandsworth and Putney*	10 0 0	10 0 0	10 — 13
1500	10	Do.	10 0 0	7 10 0	
1819	10	Do.	10 0 0	7 10 0	
1138	10	Do.	5 0 0	7 10 0	
20000	10	Western (Limited) A shares	10 0 0	10 0 0	16 — 17
10000	10	Do., B shares	8 0 0	10 0 0	14½ — 15
10000	10	Do., C shares	8 0 0	10 0 0	13 — 13½
20000	10	Do., D shares	1 0 0	10 0 0	2½ — 3
16000	5	*West Ham*	5 0 0	7 10 0	7 — 7½
551	10	West London Junction (Limited)	10 0 0	6 0 0	
520	10	Do., preference	10 0 0	6 0 0	

THE

DUKE OF HAMILTON'S

LESMAHAGOW

CANNEL COAL.

LESSEES:

THE NITSHILL & LESMAHAGOW COAL COMPANY.

OFFICE:

37, ST. VINCENT PLACE,

GLASGOW,

Where all communications are requested to be addressed.

SEWAGE IRRIGATION.

Just published, price 2s., by post 2s. 1d.,

REPORT OF PROCEEDINGS

IN

PARLIAMENT

(SESSION 1870)

ON THE

BLACKBURN CORPORATION

IMPROVEMENT BILL.

LONDON:

WM. B. KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, by an experienced Man, a situation in a Gas-Work, as Foreman, Meter Inspector, Repairer, and Fitter, or in any other trustworthy capacity. Ten years in last situation. Good reference as to character and ability.

Address F. M., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, a situation. Thoroughly understands service-laying, fitting, inspecting, and repairing gas-meters. Good references.

Apply to F. W. H., No. 4, Wellington Place, Holloway Road, LONDON.

WANTED, a re-engagement as Working MANAGER of a Gas-Work. Thoroughly understands the making and distributing of gas, main and service laying, meter-fixing and repairing, and all duties required in a Gas-Work. Unexceptionable references.

Address B. C., 123, Lillington Street, LONDON, S.W.

TAR.

THE Directors of the Cambridge University and Town Gaslight Company are open to receive OFFERS for their produce of TAR, particulars of which may be had from W. WOOD, Manager.

GAS CONCESSION.

THE Concession and Works for supplying a town of 30,000 inhabitants on the Continent TO BE SOLD. The works have been in operation for six years. Net profits made last year, £1350. Consumption steadily increasing. At present no railway communication, but one in course of construction. Price £15,000.

For further particulars, address K., Messrs. Eyre & Co., 4, Bouverie Street, FLEET STREET, E.C.

THE WREXHAM GASLIGHT COMPANY.

(CONTRACT No. 5.)

TO IRONFOUNDERS AND OTHERS.

THE Directors of the above Company invite TENDERS for the manufacture and fixing the following WROUGHT-IRON ROOFS, viz.:—

One 32 feet 9 inch span, with 13 principals.				
One 21	,,	,,	14	,,
One 50	,,	,,	6	,,
Two 50	,,	,,	5	,, each.

Also for other Ironwork as specified.

Plans and specification may be seen at the Office of John Rowe, Esq., C.E., College Street, Wrexham.

Tenders to be sent to the undersigned on or before the 10th prox., endorsed "Tender for Contract No. 5."

The Directors do not bind themselves to accept the lowest or any tender. By order of the Board,

THOMAS WALKER, Secretary.

Wrexham, Oct. 21, 1870.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 42, Parliament Street, WESTMINSTER. [Office of the JOURNAL OF GAS LIGHTING, &c.]

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

IMPORTANT TO GAS COMPANIES.

IN anticipation of the "Sales of Gas Act" coming into full operation, Messrs. BRADDOCK have prepared a LARGE STOCK of METERS, from Two Lights to Three Hundred Lights, which can be supplied on receipt of order.

Globe Meter-Works, OLDHAM.

CAST-IRON Retorts, Socket-Pipes, with Syphons, and all requisite Connexions, Lamp Columns, Wrought-Iron Tubing, Valves, Street-Lamps, Sight Holes, Furnace Doors, Ash-Pans, Charging and Coke Shovels, Iron Pails, Coke Barrows, Cross Bars, Fire Pots, Pumps, and Iron Borings.

PURIFIERS, CONDENSERS, & SCRUBBERS erected complete, or the materials supplied; and every description of goods in use by Gas-Works, in stock, at wholesale prices, at

Mr. LYNCH WHITE'S,

Old Barge Iron Wharf, Upper Ground Street, LONDON.

CAROLINE VICKARY,

(ADMINISTRATRIX TO THE LATE JOHN VICKARY,)

GAS ENGINEER, CONTRACTOR, IRON AND BRASS FOUNDER,

EXE ISLAND, EXETER,

(Established Thirty years,)

Respectfully tenders her thanks to those friends who have patronized her since her late husband's death, and having secured an efficient staff for each department of design and manufacture, she refers with confidence to works recently erected by her as a guarantee that all orders she may be favoured with will be completed in a sound and satisfactory manner.

GASHOLDERS AND TANKS,

Retorts, Retort-Fittings, Condensers, Scrubbers, Purifiers, Station-Meters, Governors, Sluice-Valves of all kinds. (Gas and Water Mains always in stock.)

GAS-FITTINGS,

Including Chandeliers, Pendants, Hall Lamps, Brackets, Star and Sun Lights of all designs, embracing the Mediæval and other periods.

GAS-METERS (WET OR DRY),

Combining the most recent improvements in principle and manufacture; upwards of 150,000 already in work, giving the highest satisfaction. (A guarantee for five years given with each one.)

Every description of **Plumbers Work,** comprising **Water-Closets, Beer-Engines, Lift and Force Pumps, Cocks for Gas, Water, or Steam, &c.**

Drawings, Specifications, and Estimates of **Gas-Works, Iron Roofs, Bridges,** and light or heavy structures in wrought or cast iron, supplied on application.

JOHN WRIGHT & CO.,

30, BROAD STREET, ISLINGTON, BIRMINGHAM.

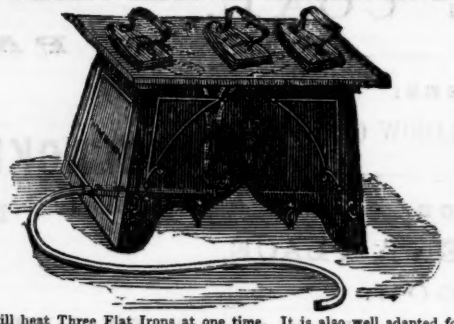
WRIGHT'S IMPROVED SQUARE GAS COOKING STOVES.

SQUARE COOKING STOVE, No. 65,

With Cast-Iron Top and Bottom, Door and Frame.

14 in. square, with small Boiling Stove on top	£3 10 0
16 in. square, with one large Boiling and Broiling Stove on top	4 5 0
18 in. square, with two small Boiling Stoves, and one large Boiling and Broiling Stove on top (as drawing)	5 5 0
24 in square, with two folding doors; two small Boiling Stoves, and one large Boiling and Broiling Stove on top	7 10 0

WRIGHT'S IMPROVED IRONING STOVE



Will heat Three Flat Irons at one time. It is also well adapted for Hatters' Irons.

Price 10s. 6d.

12 ft. of prepared Tube for ditto, 4s.
Cock and Nozzle for ditto, 1s. 6d.

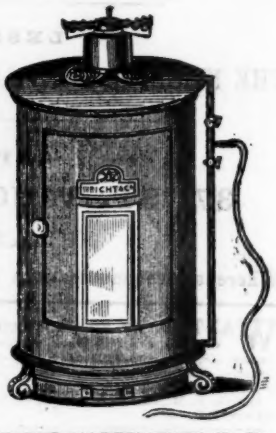
WRIGHT'S IMPROVED GAS COOKER,

FOR BOILING, BROILING, AND TOASTING.

No. 28 . . Price 45s. No. 38 . . Price 70s.

This Stove effectually and economically boils Three or Four Saucepans, and cooks (by reflection) Chops, Steaks, a small Joint, or pair of Fowls. It also makes Toast, and acts very nicely as a Salamander.

WRIGHT'S IMPROVED ROUND GAS COOKING STOVES.



ROUND COOKING STOVE, No. 68,

With Cast-Iron Top and Bottom and Glass Door.

11 in. diameter	£1 15 0
14 in. diameter	2 2 0
16 in. diameter	2 12 6
18 in. diameter	3 3 0

All the Boiling and Broiling Stoves are Atmospheric.

For Roasting, Broiling, Frying, Baking, Boiling, Stewing, or Preserving, either together or separately.

The advantages of Gas Cooking are—Its portability and cleanliness; perfect and immediate control over the heat; it requires but little attention; there is no roasting or baking fire to make up; it is always ready; it keeps the kitchen and house cool; it is economical, even where dear; and it is only alight while actually in use.

THIS REGISTERED

RADIATING GAS-STOVE

Was experimented upon, and recommended by Sir HENRY HOLLAND, Bart., Physician to the Queen, at Hull, in his Lecture on the Uses of Gas.

It is constructed on scientific principles, and gives out great heat by the perfect combustion of a small quantity of gas, avoiding both smell and smoke.

It can be fixed in any room by drawing the flexible tube over the gas-nipple of an ordinary burner, which supplies sufficient gas for the smaller size.

The following are distinguishing advantages of this Stove:—

It is portable; it is ornamental and effective; it is cheap, both in first cost and in daily use; it requires scarcely any fixing; and there is **positively no smell.**

PRICES:

No. 210 Stove, 21 in. high	12s. 6d.
,, 212 do., 26 in. ,,	17 6
,, 214 do., 32 in. ,,	25 0
12 feet of prepared Tube for ditto	4 0
Cock and Nozzle for ditto	1 6
No. 216 Stove, 40 in. high	42 0
,, 218 do., 48 in. ,,	63 0
12 feet of prepared Tube for ditto	6 0
Cock and Nozzle for ditto	2 6

Trade Discount 32½ per cent.

JOHN WRIGHT & CO.,

30, BROAD STREET, ISLINGTON, BIRMINGHAM.

WRIGHT & CO.'S HOT WATER APPARATUS & GAS BOILER,

FOR

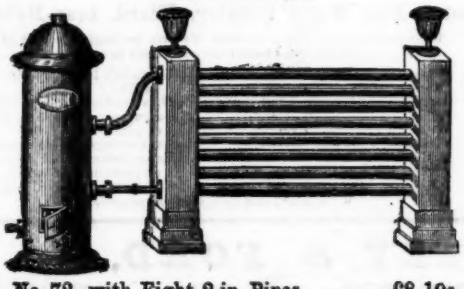
Heating Conservatories, Vineries, Propagating-Houses, Counting-Houses, Halls, Shops, Harness-Rooms, and small Places of Worship, &c.

THEY HAVE THE FOLLOWING ADVANTAGES:—

They require no setting in brickwork, and can easily be applied to hot-water pipes already in use, without disturbing any existing Boiler.
Require no attention after once lighting, and will keep up one uniform temperature.
Save the gardener's time superintending the ordinary furnace.
Are especially adapted for small conservatories where a gardener is not kept.
Occupy a small space, and can be fixed inside or outside a greenhouse.
No collection of soot caused by burning, as the flame is smokeless.

GAS HOT WATER APPARATUS, COMPLETE, requiring no Supply Cistern and little or no fixing.

Made in Two Sizes.

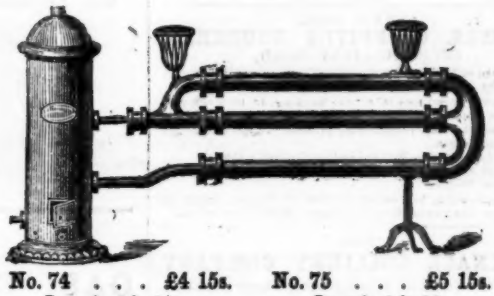


No. 72, with Eight 2-in. Pipes . . . £8 10s.
Length 4 ft. 9 in.

No. 73, with Eight 2-in. Pipes . . . £10 0s.
Length, 7 ft. 9 in.

Nos. 72 and 73 can also be had with a double row of four pipes, instead of a single row of eight, at the same price.

Made in Two Sizes.



No. 74 . . . £4 15s. Length, 5 ft. 3 in.

No. 75 . . . £5 15s. Length, 8 ft. 3 in.

This APPARATUS COMPLETE, with Supply Cistern and Air-Pipe, is adapted for Coach-Houses, and Harness-Rooms, &c.; keeps the carriage and cushions well aired, and quickly dries horse-clothing, if thrown over the pipes.

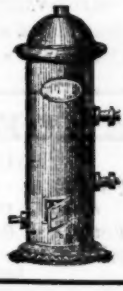
WRIGHT & CO.'S GAS BOILER ONLY.

(Made in Three Sizes.)

No. 1 . . . . . **45s.**
Length of 2-in. Pipe it will heat, 20 to 30 ft.

No. 2 . . . . . **85s.**
Will heat 60 ft. of Pipe.

No. 3 . . . . . **£5 10s.**
Will heat 150 ft. of Pipe.



The Boiler may, if preferred, be placed outside or underneath the conservatory or hall, and the connecting-pipes be lengthened for the purpose. In all cases where there is likely to be a down draught, this plan is strongly recommended.

The above compact and useful apparatus supply a want long felt for heating small conservatories, as they save the expense of having hot-water pipes fixed in the usual way, and will keep up one uniform heat at a trifling expense, and no trouble, as, after once lighting, a pint of water put in once a week is all that is required.

The combustion is so perfect that, except for conservatories, no pipe is necessary to carry off its products.

WRIGHT & CO.'S TERRA COTTA STOVES.

BEE HIVE.

These Stoves are fitted with Wright's Improved Bunsen's Burners, and throw out more heat than any other Terra Cotta Stoves that have yet been introduced.

No. 83 . . . . . **Price 25s. each.**
„ 85 . . . . . **„ 35s. „**
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Cock and Nozzle for ditto, 1s. 6d.
12 ft. prepared Tube for ditto, 4s.

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No. 96 . . . . . **Price 45s. each.**

WRIGHT'S IMPROVED TERRA COTTA STOVES.

14 in. diameter, 22 in. high.
No. 600, not Illuminated. Price 16s.
„ 601, Illuminated . . „ 21s.

This Stove has an Iron Bottom and Terra Cotta Top. The bottom contains a well, which should be filled daily with water.

No. 601 is illuminated with Ruby Glass Panels, and has a most cheerful appearance when alight.

Neither No. 600 nor 601 has atmospheric burners.

Trade Discount 32½ per cent.

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Yield of gas per ton	10,296 cubic feet.
Illuminating power rather over	21 sperm candles.
Yield of coke per ton . . .	12 cwt.

The actual working, as reported by one of the largest gas companies in Yorkshire, gives results still more favourable, viz.—

Yield of gas	10,416 cubic feet.
Illuminating power	21·89 sperm candles.
Coke	The same.

We add from the same source the capabilities of the common gas coal—

Yield of gas	10,080 cubic feet.
Illuminating powsr	14·41 sperm candles.
Yield of coke	13 cwt.

COLLIERIES—WEST ARDSLEY, near LEEDS.

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Beg leave to call the attention of Gas Companies to the superior quality of their Cannel for gas-making purposes.

This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.

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Waggons supplied for delivery by railway to any part of England or Wales.

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HUCKNALL COLLIERY COMPANY
Can offer a CANNEL COAL yielding a large quantity of Gas of superior quality.

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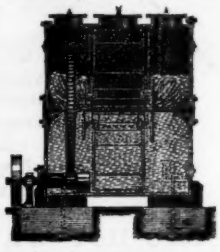

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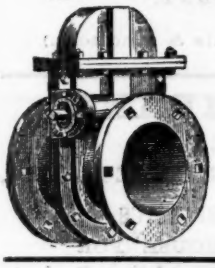

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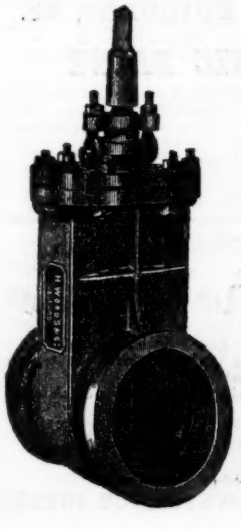

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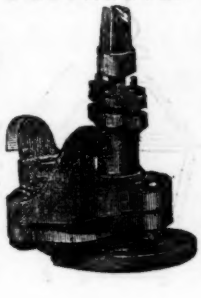

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NEW FLEXIBLE VALVE

FOR

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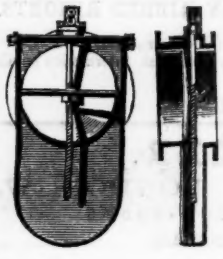
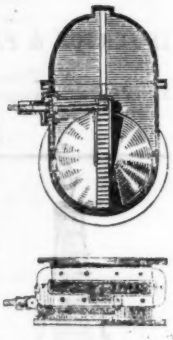


This Valve has been designed to meet what has hitherto been felt a great want, in Gas-Works especially—namely, a *really tight* Valve which could be depended upon.

The new Valve is simple in construction, not liable to get out of order, cheap in price, and the principle can be adapted to every part of Gas Apparatus where a Valve is required.



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"*Tunbridge Wells Gas Company, Dec. 13, 1869.*"

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Efficient and durable TAR, LIQUOR, and SYPHON PUMPS,
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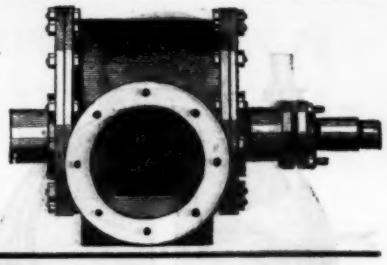
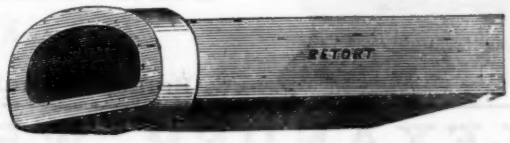


KING BROTHERS,

STOURBRIDGE FIRE-BRICK AND RETORT WORKS.



KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them FREE FROM CRACKS AND CORRECT IN FORM. By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonise.

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Every Retort and Brick is branded "King Brothers, Stourbridge."

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THE FARNLEY IRON COMPANY,

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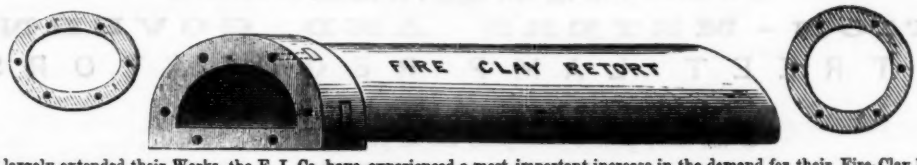

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The Fire-Clay raised from the Farnley Estate (commonly called the Wortley bed) is unsurpassed by any other known in the district, and is peculiarly well adapted for Retorts, Gas-Ovens, and Fire-Bricks; and the F. I. Co. beg especially to invite those connected with Gas-Works, who have not yet used their Retorts, to be good enough to favour them with a trial.

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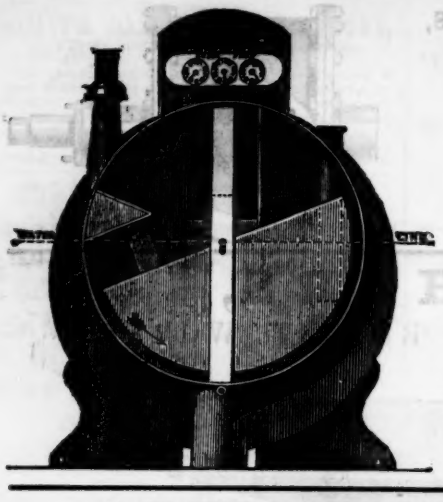

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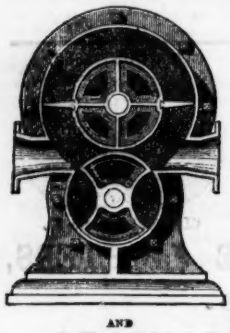

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